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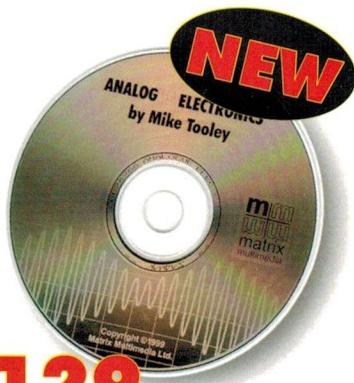


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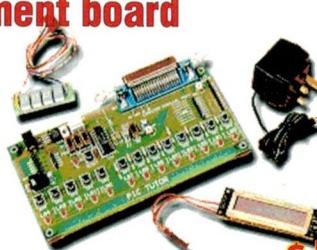
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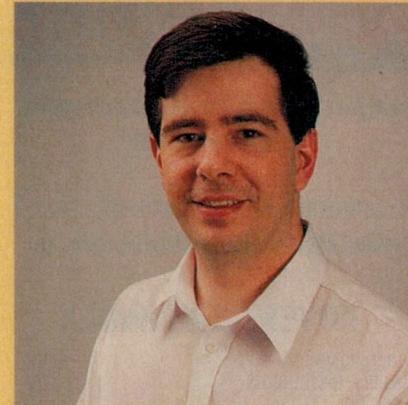
By the time you read this, I should be winging my way to Germany in order to attend Productronica99, the largest electronics trade fair in the world.

Productronica is much like the annual Consumer Electronics Show (CES), only instead of presenting all the latest gadgetry, Productronica covers all aspects of electronics design and manufacturing that goes on behind the scenes.

I had a taste of what to expect when I recently attended the Australian Elenex and Automate exhibition, held at Sydney's Darling Harbour in late September. Over

1500 exhibitors were there, showing off everything from their latest pick-and-place machines and industrial robotics, to CAD CAM packages and pneumatic linear actuators.

Of course the robots stole the show, with a couple of large displays demonstrating the speed and precision of modern industrial robotics and material transport systems. Who can fail to be impressed by a 20 tonne robot arm positioning car parts with an accuracy of less than a millimetre, or a pick-and-place machine playing Chinese chequers faster than your eyes can follow?



Yes, I like trade fairs, but not because I'm in the market to buy a new wave soldering machine - the reason I find them so appealing is due to their diversity.

It is all too easy to become more and more specialised in the work you do, and to forget about all the other aspects of the industry - no matter what field you're in. Seeing how other people have addressed their problems, seeing how far a particular

Trade shows: they're full of PWKWTATA

technology has advanced, even seeing how a product is marketed gives you new insights into the work you might be doing.

The other major attraction of trade fairs is the high concentration of PWKWTATA: People Who Know What They Are Talking About. Walk up to a stand displaying a technology you know little about (the termination of fibre optic cable, in my case), and you'll find some PWKWTATA that would be more than happy to explain all tricks of the trade, and are quite likely to give you a hands-on demonstration into the bargain. You'll get far more out of this than you will from reading any number of textbooks on the subject, and it's far more enjoyable too.

So that's why I'm off to Munich - to learn a lot, to see what's new in the electronics manufacturing field, and above all else, to enjoy myself.

New email addresses

In case you hadn't noticed, the email addresses for Electronics Australia have been changing over the last few months. We now have a more uniform naming convention, and a couple of extra addresses to help sort the incoming flood of email. If you refer to the list below before contacting us, you can be sure that your message will get through to the right department. And while we can't promise to answer every message personally, we'll certainly do what we can to help.

info@electronicsaustralia.com.au for all general enquiries.

elt@fpc.com.au for all Reader Services enquiries, (orders, back issues, etc.)

subs@fpc.com.au for all subscription information.

electaus@fpc.com.au for submission of editorial material, letters to the editor, etc.

Graham Cattley

Member of the Audit
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Established in 1922

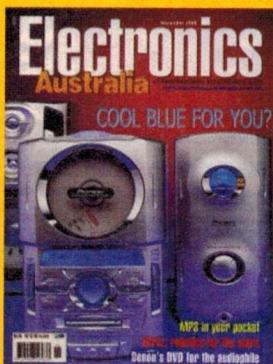
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...on the cover



'Futuristic Retro' is how Pioneer describe their new IS minidisc system, and we think that it's a pretty good description... It's blue and silver, and it sounds great too - we love it. Check out our review on page 12. (Photo by Michael Pugh)

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I love trade shows - they're full of PWKWTATA...

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New Micro-system from Technics,
Colourful car sound, Fujitsu's widescreen plasma display,
Tiny megapixel camera.



IS — Pioneer's bold new shelf system

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Is cool blue for you? Pioneer's futuristic design for this new Minidisc system certainly caused a stir when we had it in here for review.



DVD-5000: impressive DVD

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Denon's high end DVD player is about the best you'll get - not only does it exceed the Lucasfilm 'THX Ultra' specification, but it can handle the new HDCDs as well...



OzPoz

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Australian designed robotics help us get the most from the Very Large Telescope.



Smart VCR

22

Hitachi's latest VCR offers a new tape navigation system that lets you choose a particular recording from an on-screen menu, making it ideal for security applications.

Canon's colour MFC

26

We test drive the Multipass C50 MFC, which can print, scan and copy images and documents in full colour.

Listening to D'music

28

The D'music is quite the nicest personal MP3 player we've seen. It's small, lightweight, and has voice recording capabilities too.



Professional Electronics

Moffat's Madhouse

Fire will fall from the sky, the earth will split open and swallow up all humanity - or maybe not.

Open Fist

The disappearance of research funding.

Forum

Your software may be cruising the net, even if you aren't.

The Serviceman

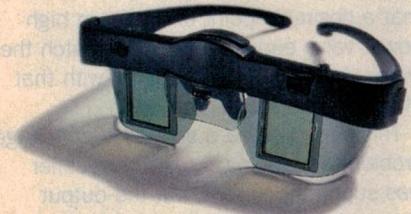
Pst! Wanna buy a cheap VCR? Somebody did, and lost out.

Video Sequencer

Build this simple sequencer, and monitor up to four different video cameras.

Nu Shades

Shoot your own 3-D movies, and then settle back and watch them through these high-tech goggles...



Circuit & Design Ideas

Servo amplifier; Precision drilling for PCBs; Monitor power switch for ATX systems; Power regulator for soldering irons.

Sprinkler Doubler

Automatic reticulation systems are great, but what do you do if you want to add an extra sprinkler? Build this!

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Control your VCR or DVD player from another room - without laying cables.



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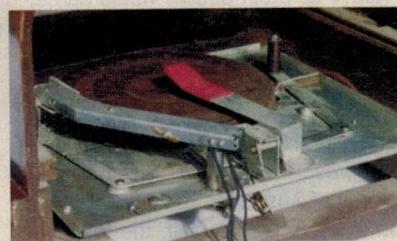
Installing NT, bus wired networks, hidden messages, and a pretty good download manager.

\$10 Wonders

Precision seconds timer: Better than 0.003% accuracy, without calibration!

Vintage Radio

Tapped volume controls and bass boost circuits.



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Mini Inverter

Only need a few watts? This inverter can handle up to 75W, and is cheap to boot.

Education & Training Feature

Want to turn your hobby into a career? Deepen your knowledge by taking one of the many courses available.

History & Crossword

All the latest from 50 & 25 years ago, plus something to keep the grey matter busy.

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12-bit serial DAC, IrDA transceivers run at up to 4Mb/s



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Is the latest from Red Hat ready to compete against Windows?

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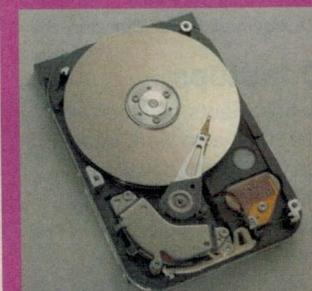
Slide Regulator

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Also known as a Variac, this slide regulator can deliver 0 - 260V, at 500VA.

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Letters to the Editor

Theoretical wavelength

I was most interested to read about Cell and Electro-Chemical Reactions (Open Fist, Sep 99), but I must take exception to two paragraphs where you mention "...the sub-audio range where the wavelengths are thousands of kilometres (long)" and again "...the disparity between the 50,000km wavelength and this microscopic reaction of cells..." (surely that should be "reaction within cells of microscopic size").

For goodness sake, this is the wavelength of an electromagnetic wave propagated in free space. We are hardly talking about 'free space' in this case, nor about electromagnetic propagation, but rather the chemical reactions occurring within the cells of living organisms.

You will doubtless be aware that the conversion of electromagnetic energy into another form allows resonances to occur in media where the rate of propagation is vastly different. As one example, consider the ubiquitous ceramic resonator used to control almost every watch and clock — here we have a resonant frequency of 32,768Hz, corresponding to a wavelength of about 9km, occurring within the confines of a case about 5mm long and 1.5 mm diameter. So what has a 9km wavelength to do with these resonators? The same as the 50,000km wavelength related to the resonance in cell tissue — absolutely nothing!

I do enjoy your articles, which are well written and presented, in the main, but why did you bring in such a furphy as the theoretical wavelength in free space? All it does is create confusion into an otherwise interesting and (in my opinion) important subject.

G.D. Mayman, Dover Gardens, SA

Mono LCD laptops

I fully support comments by Albert Hill (Letters, June 1999). I also work in an area where I use laptops to download from data collectors in the field. I have been carefully nursing a couple of ancient machines with LCD displays because of the difficulty in reading the modern screens. Y2K compliance has now caught up with me and I have had to replace these machines. Like Albert we searched the major manufacturers but alas, only colour screens were available.

These are proving to be absolutely painful to use in full sunlight and this has already led to errors caused by incorrectly reading the screen.

Albert is definitely not the only person in Australia who uses a laptop in full sunlight. Recording traffic data is becoming an increasingly important task for all the State Road Authorities in Australia and they all have significant investment in electronic monitoring equipment and personnel working in this area and using laptops in the field. It is becoming so important that most Local Authorities are purchasing equipment and training personnel also. I personally know of Geologists who work in the field with laptops and who also complain of the poor readability of latest technology screens in sunlight.

I hope more of your readers will respond to Albert's letter and that this prompts some manufacturers to consider our plight.

Ray Hildreth, Mackay, Qld

WIA a threat?

I would like to bring to your attention, as I know now, more than ever, this is the time when we need to abolish Morse code proficiency testing and in doing so promote the hobby of amateur radio.

This is as most people would agree, obsolete and outmoded and not attracting people to the hobby. However, what I find most distressing, is the Wireless Institute of Australia's selective truthing process and the fact that the WIA does not represent the views of myself or the majority of Australian radio amateurs.

In trying to justify itself, the WIA continues to provide results in its favour, such as the Morse survey in recent years with questions like 'is Morse code applicable to an A.O.C.P. licence?' — not to mention the Australia-wide Morse survey, the results of which were never found. The WIA having only 4,500 members continues to ignore the majority and misrepresent the amateur community at government level in lieu of itself.

Not responding to correspondence from non-members, including myself, also furthermore stating that it makes decisions for its members only is hardly democratic, given the current climate of only 15,000 licenced radio amateurs. (I wonder why?) Therefore, the W.I.A. must

be seen as a threat to the continued growth of amateur radio.

In closing, what I would like to ask is that Electronics Australia run a survey or something similar to push to get rid of this ridiculous and outmoded testing requirement. I am sure that many people working in technical backgrounds qualified well above A.O.C.P. theory would agree.

Julian O'Donnell, VK3TYB

One flash and you're gone...

Just a note regarding the Serviceman column in the September issue and his comments regarding earthing, and shorts to ground in the primary of his hifi mains transformer.

It makes one think twice about how little an earth leakage cut-out switch costs, doesn't it!

Brad Sheargold, Collaroy NSW

Diode bridge the cause?

I read with interest your Serviceman column in the September 1999.

It occurs to me that the reason for the transformer 'blow up' in Peter Lankshear's amplifier could well lie with his replacing the valve rectifier with a diode bridge.

Thinking back a few years, I remember that a desirable point of design in high power valve equipment was to match the warm up period of the rectifier with that of the output stage.

This was to avoid a serious over voltage problem developing, when the rectifier was supplying current, but the output stage was not ready to receive it. The resulting stresses typically took out the filter caps and/or the filter choke, rectifier, transformer combination.

The article also reminded me of a transistor amp I was asked to look at a back in the early 60's when such equipment was still rare. The friend, who brought to me just said, "it blew up". That was an understatement. The whole of the preamp circuitry was quite literally melted, with some components vapourised. I had to tell him it was a write off, but the fact that the damage was mostly in the front end, led me to ask him what were the programme sources he was using. He said that he had a tuner and a turntable and, oh, he had recently had his TV set connected to it.

WHAT'S NEW

in the ever-changing world of electronics

Widescreen plasma panel

Delegates at the recent SMPTE Exhibition in July were given a sneak preview of Fujitsu General's new Plasmavision screen, to be known as the 'Alis' (Alternate Light Surface), which has a target release date of December this year.

Compatible with Digital TV 1080I, the AliS will be ideal for the broadcast industry, high-end graphic users and control rooms. Fujitsu General has developed a remarkable 16x9 pixel to achieve true XGA resolution (1024 x 1024) in the new panel.

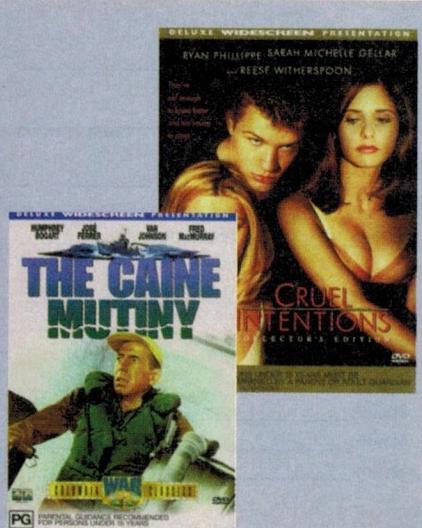
For more information contact Fujitsu General (Aust), 100 Holbeche Road, Arndell Park 2148 or phone (02) 8822 2500.



New DVD titles released

Columbia Tristar Home Video has released the following new titles in Region 4 (Australia and NZ):

Apt Pupil	Thriller, MA
Jason and the Argonauts	Adventure, G
Universal Soldier	Action, R18+
Disturbing Behaviour	Thriller, M
Bad Boys	Action/Comedy, MA
The River Wild	Thriller, M
Apollo 13	Drama, PG
Meet Joe Black	Drama, M
The Nutty Professor	Comedy, M
Psycho (1998)	Comedy, M
Casino	Drama, R
Happy Gilmore	Comedy, M15+
Mercury Rising	Thriller, M15+



Out of Sight	Thriller, M15+
The American President	Drama, M15+
Shakespeare in Love	Romantic Drama, M15+
The Big Chill	Drama, M15+
Midnight Express	Drama, R18+
The Wild One	Drama, PG
Hideaway	thriller, M15+
In God's Hands	Adventure,
M15+	
The Caine Mutiny	War, PG
Silverado	Western, PG
Cruel Intentions	Drama, MA15+

Tiny Fujifilm 1.5M pixel digital camera

Fuji Photo Film (USA) has unveiled a notable addition to its signature 700 series of pocketable megapixel digital cameras — the Fujifilm MX-1700 ZOOM. It features an improved, high resolution 1.5-million pixel CCD with RGB colour filters, along with a newly crafted all-glass, miniature aspherical zoom lens. The results are claimed as outstanding image quality and superb colour reproduction.

Sporting dimensions of 79 x 120 x 32mm, the new megapixel model is roughly the size of a deck of playing cards, easily fitting in shirt pockets or pocket books. It records high-resolution images at 1280 x 1024 or at 640 x 480 resolutions, and the 3x aspherical zoom lens delivers 35mm equivalent range of 35-114mm coverage. The US suggested retail price is US\$599.



Micro system from Technics

Panasonic has released a new Technics micro component system designed for maximum efficiency in delivering crisp, dynamic sound. The stylish SC-HD501 is claimed ideal for consumers who want a high-quality compact system that doesn't dominate the room, or for those looking for a second system for study or bedroom.

The four-component system has a flexible, modular layout with aluminium 'pale gold' front panels and wood-grain side panels. It incorporates a CD player, single cassette deck, FM-AM tuner and two speakers.



The system has a stereo output of (15W + 8W) x 2 (RMS), via a multi-driver bi-amp system which provides direct drive to each speaker. Sound projection and quality is maximised through a balanced dome tweeter and PP mica woofer.

The system also has an energy-saving design, with an Eco Mode button. In this

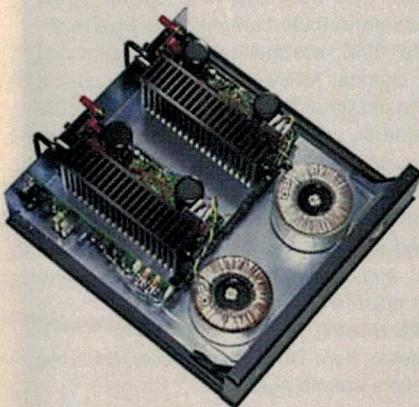
mode, the displays switch off during power standby, reducing consumption from the usual 9-11W to less than 0.8W.

The SC-HD501 micro component system has an RRP of \$1259 and is available from leading electrical retailers and hi-fi specialists. For more information contact Panasonic Customer Care on 132 600.

Home theatre amps from Madrigal

Explosive growth in the home theatre and custom installation markets has driven the need for better and more flexible amplifier options from leading audio manufacturers. Madrigal, maker of the popular high-performance Proceed brand of home theatre and music system components, has added to their range with two new models called BPA 2 and BPA 3.

The designs are said to build upon techniques used in the successful Proceed AMP



2 and AMP 3, while borrowing elements from the newer HPA 2 and HPA 3. The exposed internal heatsink design is said to offer superior cooling of the powerful output stages, while keeping the chassis appearance smooth and subtle. "It's not your typical design concept," says Madrigal CEO Phil Muzio. "Other amps try to flaunt their power. Some even look dangerous. The Proceed amps look both strong and approachable at the same time, making them well suited to home living environment - aesthetically and mechanically."

For more information, visit Madrigal at www.madrigal.com.

Iomega goes optical

Iomega Corporation has announced its entry into the optical storage market with its first CD-ReWritable (CD-RW) drive, the ZipCD. Designed for corporations, PC enthusiasts and Internet users, ZipCD will give users the ability to back-up, archive, transport, share and create up to 650MB of data on a common CD format.

ZipCD is claimed an ideal solution for customers who appreciate the portability and ease of use they have come to expect from Iomega solutions, for their higher capacity storage needs. With ZipCD, companies both large and small can now back-up and archive data, as well as transport and share important files and presentations on a common CD format.

For PC enthusiasts and Internet users, ZipCD is a fun and useful product for saving and sharing original music, photos,

games, internet content and more.

The internal E-IDE 4x4x24 drive will be the first in Iomega's line of optical products. It's expected to be priced at an RRP of \$499.

With the ZipCD Iomega will be bundling a wide array of software tools and accessories, including Adaptec's DirectCD and Easy CD Creator, Avery Media Software, Iomega QuikSync, Adobe PhotoShop 5.0 LE and a ZipCD animated installation tour.

For more information contact Iomega Corporation Australia, Level 1, 48-50 Alfred Street, Milsons Point 2061 or visit the website (www.iomega.com).



WHAT'S new

in the ever-changing world of electronics

Economy DVD player has Dolby Digital decoder



With an RRP of \$1099, the new Hitachi DV-P250A offers features giving users full control over their viewing and listening experience — such as full Dolby Digital 5.1 analog outputs for use with older analog surround sound amplifiers, and the dual lasers giving the ability to read CDR and CD-RW recorded discs.

The player uses a 10-bit D/A converter for high video quality and Hitachi's own SuperH 32-bit RISC processor engine, making its powerful features easily accessible to the first time user.

To allow the maximum quality in video reproduction, the DV-P250A offers component video (Y/Pb/Pr) outputs, via three RCA sockets on the rear. Also available are the more common S-Video and composite video outputs.

The audio stage in the player is controlled by a 24-bit D/A converter operating at 96kHz. Outputs include down-mixed stereo, plus both coax and optical digital bitstream outputs compatible with straight digital PCM, two-channel Dolby Digital and two channel MPEG, full 5.1 Dolby digital (AC-3) or Digital Theatre Sound (DTS) for the maximum in audio surround sound. However in addition the player has a built-in Dolby Digital 5.1 (AC-3) decoder allowing users of older stereo or analog surround sound systems to simply take the six line-level analog outputs and plug them into their amplifier.

The Hitachi DV-P250 DVD player is now available from Hitachi consumer products resellers around Australia.

New IDE CD-R/RW Writer from Kodak

Kodak says you can do almost anything with its new 4804IDE CD-R/RW Writer — audio, video, data, in fact any sort of information is at your beck and call, and you can use both CD-Recordable or CD-Rewritable discs.

Everything you need is supplied in one box, which includes all the cables, software and hardware needed to get burning fast. The audio connection cable supplied is 5m long, to allow for the fact that most computers are not sitting on top of your hifi.

The 4804 comes with all the software needed to record audio, remove pops and hisses, apply any EQ changes and fades, scan for track breaks, and cut your own audio CD, playable in any Audio CD player. You can even convert MP3s to audio CD format in seconds. It can also convert any AVI



file into the videoCD format, playable on any VideoCD player.

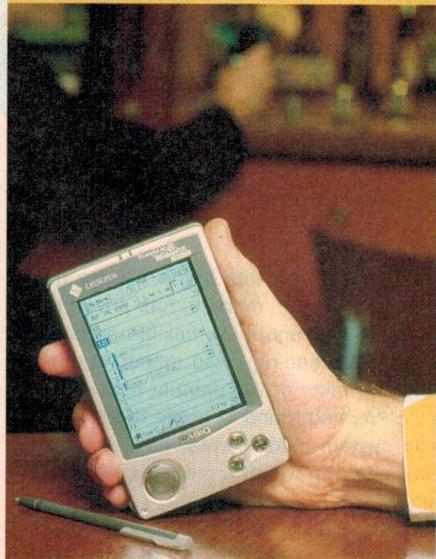
For data the 4804 can write in standard CD-ROM (ISO9660) format, which means you can create a disc readable by just about anyone with a CD-ROM drive. And with CD-R or CD-RW media you can fit a whopping 650MB of data on one standard CD-R/CD-RW disc.

More information is available from Kodak dealers.

World's smallest multimedia colour palmtop

Casio Computer has released what's claimed as the next generation in mobile computing, the Cassiopeia E-100 colour palm-size PC. The pocket-sized unit extends the power of the palm-size PC platform with its vivid colour and powerhouse multimedia capabilities, enhancing viewing of photos, movies, games and web browsing.

Packed with features, the Cassiopeia E-100 is claimed as the fastest palm-size PC on



the market with 131MHz and an impressive active matrix LCD screen with 65,536-colour depth. Other features include Microsoft Windows CE 2.11, e-mail, dual time world clock, serial port, stereo headphones jack, microphone/speaker and lithium-ion rechargeable battery. It also offers users seamless desktop synchronisation, infrared capabilities, 16MB of memory and expandability via its CompactFlash port. A powerful 16MB ROM upgradable operation system enables users to store thousands of addresses, memos, to do lists and meeting notes with the additional option of a CompactFlash card for unlimited storage and access to large files, movies, audio books, music and games.

Greater functionality is provided with up to 8 hours operation using rechargeable lithium-ion batteries, an action switch and cursor pad and power save modes.

The Cassiopeia E-100 has an RRP of \$1199 including tax and is available from Casio resellers and leading retail stores.

Colourful mobile sound systems



Compact personal fax from Brother

Brother's compact new FAX-515 offers many functions that can be found on more advanced machines, whilst also being very competitive in the price race.

This attractive unit includes a phone, fax and copier all in one machine. But what sets it apart from other machines in the thermal category is the novel Brother Anti-Curl System and ThermalPlus Paper. Added to the automatic paper cutter this gives a professional finish to all those documents that have taken hours to produce.

Other features include a 10-page automatic document feeder, one-touch dialing for up to 10 numbers, speed dialing for up to 50 numbers, multiple resolution transmissions, next fax reservation, an electronic telephone index, Caller ID compatibility and enhanced remote activation.

Also available as an optional extra for the FAX-515 is the multi-function link, a PC interface that allows for the user to use the fax as a printer or copier.

For more information contact your local Brother dealer or Brother International Australia, 7 Khartoum Road, North Ryde 2113 or phone (02) 9887-4344.

Audiophiles now have the opportunity to show their true colours, thanks to the release of Blaupunkt's new Fun Line range of car sound systems — available in formula-red, speed-yellow, flame-blue or anthracite.

A key feature of the stereo receivers is the DigiCeiver concept, which delivers outstanding reception via completely digital, no loss signal processing that begins directly behind the antenna jack and continues through to the output. The addition of a Codem D AM/FM/LW tuner ensures extremely quick seek tuning, improved selectivity and reduced interference.

At the Las Vegas Consumer Electronics Show in the USA in January, Blaupunkt was awarded the 'Best of Show Award' for its Digiceiver radio as featured in the Fun Line range.

Fun Line CD radios feature 4 x 40W power 32x



oversampling (industry standard eight times) and direct software control that allows easy menu adjustment of your favourite settings.

Available in four units (Acapulco, Sevilla, San Remo and Florida) Fun Line CD radios deliver the type of crystal-clear sound that has made Blaupunkt the world's leader in car audio systems. Fun Line cassette radios also come in a choice of four units — Saint Tropez, Munich, Siena and Louisiana.

For more information contact the Blaupunkt Customer Service Hotline on 1800 629 414.

High-end Marantz home theatre receiver

Marantz has announced the introduction of its new top of the line SR-18 home theatre receiver which commemorates the thirtieth anniversary of the Marantz Model Eighteen, reportedly the world's first true high-end receiver.

In addition to Dolby Digital, the THX certified SR-18 includes DTS decoding capability, for DTS-encoded DVD discs. It also provides Dolby Pro Logic and Dolby Surround decoding along with a variety of additional surround modes, including enhanced surround from two-channel music sources. Complementing this, it incorporates THX 5.1 post-processing using advanced DSP processing circuitry with 96kHz/24-bit decoding and high-resolution playback of 96/24 DVD audio discs.

Rated at 140 watts (into 8 ohms) for each of its five main amplifier channels, the SR-18 offers two sets of component video inputs, plus a wide range of additional inputs and outputs including S-video switching, four digital inputs, two digital outputs and an RF input for laserdisc players.



The SR-18 provides AM and FM tuning using a Gyro-Touch tuning wheel, and includes a station naming function and auto preset memory. Other features include a Source Direct switch that bypasses the tone controls, a Dolby Digital Night Mode that reduces overall dynamic range for quieter evening listening, a TV Auto On-Off switch and more. The Marantz SR-18 has a suggested retail price of \$4,990.00; contact Jamo Australia on (03) 9543 1522 for more information. ♦

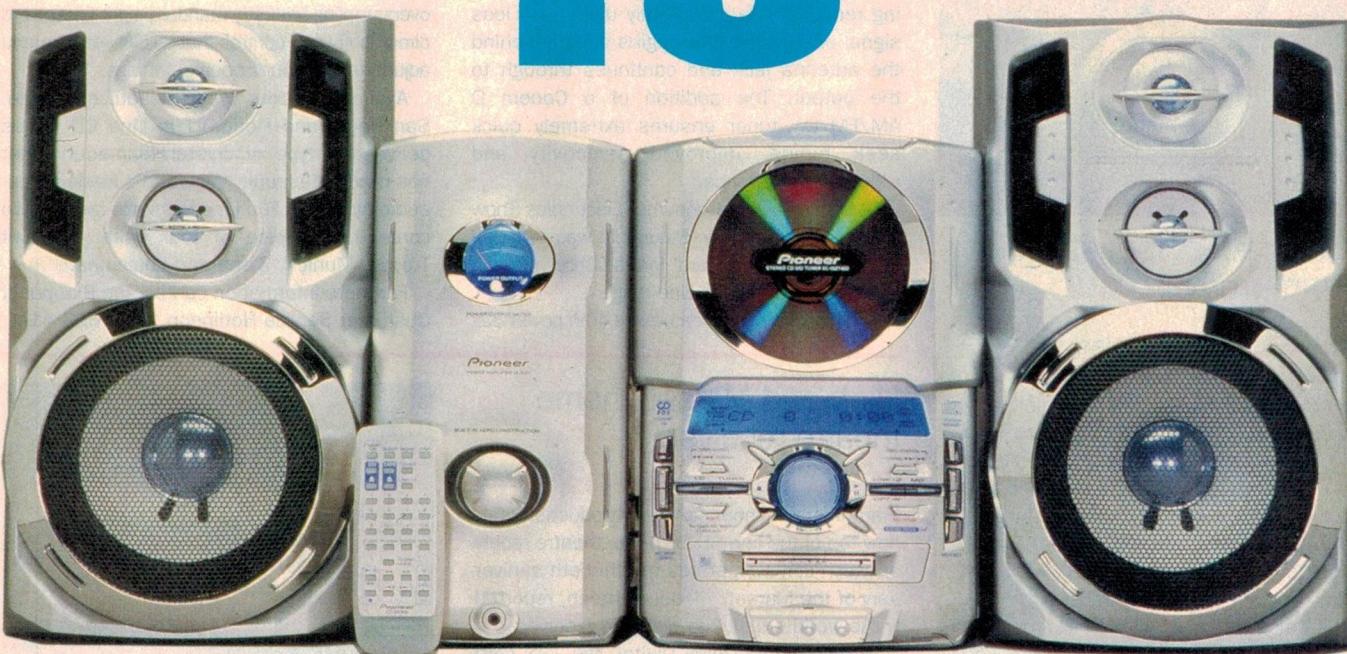


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Pioneer's bold new shelf system



It's a bird! It's a plane! It's the warp drive unit from the Starship Enterprise! No, it's Pioneer's latest foray into the lucrative 'youth' sound system market; a radically-styled, feature-packed shelf sound system with — smiles all round — a MiniDisk recorder.

by Rob Evans

You can see it now. The marketing department and their stylists enthusiastically filling whiteboards with radical shapes and panel layouts for a bold new compact sound system, while the engineers huddle in a frightened pack at the rear of the room trying to figure out how they can make the whole thing work. It may sound like one of Dilbert's nightmares, but in the tough and competitive so-called youth markets style is the primary factor in the design and the engineering side just has to do its best to accommodate it.

WHAT IS THE IS?

CD/MD Tuner stereo-wide; 3-mode timer; Bass/Treble; vertical-mount CD player with motorised door, random/repeat play and 24 programs; slot-load MiniDisk with disc title memory, full edit modes, auto record level control, digital/analogue input selector, sampling frequency converter and optical digital input; AM/FM tuner with 25 presets and auto tuning; dimensions 205 x 300 x 237mm; weight 3.1kg.

Amplifier 100W power output; analogue power meter; distortion cancelling/limiting system; dimensions 150 x 300 x 233mm; weight 4kg.

Speakers 3-way bass-reflex with 170mm woofer, 65mm midrange and 20mm tweeter; dimensions 210 x 367 x 268mm; weight 4.1kg.

When you're a company with the credentials and experience of Pioneer though, this type of design and engineering challenge is clearly taken in its stride — particularly if the IS-21MD shelf sound system is anything to go by. Arranged in a vertical format with separate control and power amp units, the IS system has an undeniably striking look about it with its silver and blue colour scheme, bevelled edges and radically shaped control buttons.

The look is probably best described as 'futuristic retro' (as

suggested in a Pioneer press release), and is somehow reminiscent of how 1950s science fiction movies depicted the future. This feel is supported by the novel analogue output power meter on the amplifier module and the control unit's vertical CD arrangement, but perhaps less so by the speaker system's aggressive styling.

In any case, the IS-21MD's looks certainly caused strong comments from anyone who saw it, with most people quite polarised in their views — put simply, they either loved it or hated it, and this seemed to be quite unconnected with their age...

Appearance aside though, the IS system is jam-packed with features that should keep knob-twiddlers happy for hours on end. The most popular of these was the motorised sliding cover on the CD player, which can be activated by the remote control or via a touch button on the top of the unit — we really had to drag people away from that one. The built-in Minidisc recorder is the real gem here though, and can be used to record directly from the CD using an automatic track synchronising system, or from any of the unit's other sources in a conventional way.

Along with CD and Minidisc playback, the control unit also offers you the choice of two analogue line inputs and one optically coupled digital input, plus the signal from its built-in AM/FM tuner. Connectors for the digital input and one line input are sensibly located under a flap at the bottom of the front panel, by the way. The most popular choice of recording source for the Minidisc is sure to be the CD player though, and thanks to the auto sync func-

Love it or hate it?

The Pioneer IS system attracted so much attention in the EA office that in the end we became a bit tired of people just popping in for a look, and decided to make them pay. The payment was to record their vote for or against its appeal, with optional comments.

Word had obviously spread through the building, as in the space of a couple of hours we had around 35 people pass through to take a look at the system. And the result? Pretty much a resounding victory for the 'love it' voters, with only 12 or so people registering a negative opinion — we could have sold the unit about five times over, during that time...

Here's a few comments (both good and bad) recorded by the 'punters' as they passed through. Names have not been supplied, so as to protect the guilty.

- "I just love the blue"
- "Won't fit with my apartment decor"
- "Looks great and sounds great"
- "Yuck!"
- "Overwhelming..."
- "Hey, funky!"
- "Where's the CD stacker?"
- "\$1299? I thought it would be more like \$5000"
- "Whatever happened to classic design?"
- "Beautiful, but dumb"
- "Ugly, disgusting"
- "Fab for a modern apartment"
- "It's very shiny..."
- "It makes me dizzy"



No, it's not a Minidisc player. This is the cassette-based version of the IS system (the IS-21T) which features a natty slide-out tape tray mechanism. It reduces the overall system price by \$300, but the record/playback performance isn't even close to that of the MiniDisk version.

tion the recording process just involves the push of one button.

If you want to do anything more than a straight recording of a series of CD tracks, the various Minidisc editing features come into play. In this case you need to use the unit's track editing facilities (erase, move, name, and so on) which are accessed via the front panel buttons and on-screen display. Unlike a conventional cassette recorder the Minidisc system is a very flexible setup in terms of track arrangement, and is more like a computer disk file management scheme than the linear system of tracks we normally associate with audio recorders. The editing process can get confusing at times, but the end result is usually worth it.

Being a so-called shelf system as opposed to a mini system, Pioneer have taken advantage of this larger format by equipping the IS-21MD with a quite meaty set of speakers. These are a three-way affair featuring a 17cm woofer, a 6.5cm midrange unit plus a 20mm dome tweeter, and are powered by the free standing power amplifier unit.

Ignoring the ever-optimistic PMPO power rating of 2000 watts, the amplifier appears to be rated at a very healthy 100 watts RMS per channel into 6 ohms. The amplifier is fan cooled and equipped with an output power control system, which is described in various ways in the literature, but appears to be a fairly straightforward signal limiting circuit — presumably it's needed for a youth market.

Thrusters at full power, Captain

So how does all this gadgetry work in practice? Very well,

Minidisc Specs

Media

Recording/Playback time:
74 min

Cartridge size:
72 x 68 x 5mm

Disc diameter: 64 mm

Track pitch: 1.6 um

Linear velocity: 1.2-1.4

m/sec.

Audio characteristics

Channels: 2
(stereo/monaural)

Frequency range: 5Hz to
20kHz

Signal format

Sampling frequency: 44.1kHz

Compression system: ATRAC

Modulation system: EFM

Error correction system:

CIRC

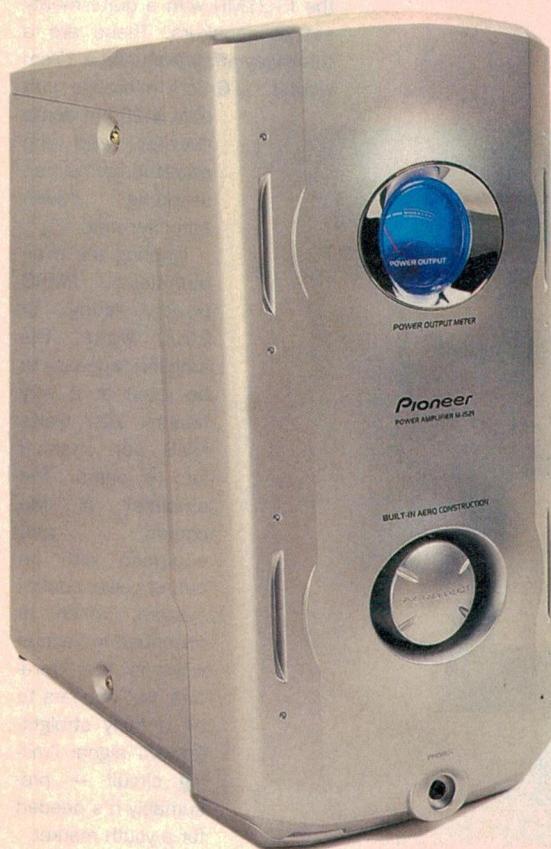
Optical parameters

Laser wavelength: 780nm

Recording power: 5mW (max)

according to all those who operated and auditioned the system. In terms of sound quality and output level, Pioneer appear to have hit their target market very well. The IS system is capable of very high volume levels with very little signs of stress, thanks to the amp's capable output power and limiting circuit, and the speakers do a very creditable job in the process.

While it was probably due a degree of prejudice against the speaker's looks, we were initially a little dubious about their capability — a typical weak link in most small systems. There are a few minor resonances in the box and the tweeter unit becomes a little harsh at very high power levels, but in the end, we'd have to say that they're very well suited to the



The IS system's 100W amplifier module sports a novel blue-backlit power meter for that 'futuristic retro' look. We're not sure what the lower 'Aero duct' molding is supposed to do, but then again, it made us look...

Minidisc:

what it's all about

Minidiscs? I've heard of them...

I'm not surprised — they were developed by Sony years ago (well, back in 1992, anyway). It was a new digital medium for recording and distributing high quality audio, and offered 74 minutes of near CD quality sound in something resembling a mini floppy disk (A version of Minidisc for storing computer data was actually released a year later).

They died out though, didn't they?

Well, yes. Minidiscs didn't catch on as quickly as Sony hoped, mainly because they were developed around the same time as Digital Compact Cassette (DCC), and Digital Audio Tape (DAT). With three new audio formats available, consumers weren't sure which would become the standard, and so were a little reluctant to rush out and buy the latest player for the latest disc, tape or whatever.

The manufacturers didn't really know which would catch on either, and so didn't produce that many players for any of the formats. In the end, all three formats practically disappeared from the market, while consumers went back to their tried and trusted tapes and CDs.

So they're back?

It seems so. While you could always buy little personal players, Minidisc systems are now starting to appear in mini and

shelf-top systems, and look as though they'll make it this time. This resurgence is partly due to the absence of DCC and DAT in the consumer sector, and partly due to the fact that Minidiscs are a darn good audio format.

What, better than CD?

Better in some ways, yes. They're small light and compact, re-recordable up to a million times, and offer a comprehensive file management system built into the recorder/player. Recorded tracks can be named, deleted, reordered, and existing tracks can easily be merged together or split into separate tracks.

This is all possible because Minidiscs use a Table Of Contents (TOC) that contains an index of the start and finish points of each track, along with space for storing the title, artist and other info for the track. This TOC can simply be re-organised to suit, and Minidisc recorders have operating systems that make all this pretty straightforward. Just about all Minidisc recorders also offer a direct optical digital input to allow superior recordings too.

So in what ways aren't they better?

A single Minidisc holds the same amount of music at the same sampling frequency as a CD (74 minutes, sampled at 44.1kHz) but it uses a method called ATRAC (Adaptive TRansform Acoustic Coding) that gives a compression ratio of around 5:1.

ATRAC is a form of lossy data compression that attempts to encode only the parts of the signal that you can actually hear.

Technically speaking, the input signal is divided into three sub-bands that are transformed into the frequency domain using a



variable block length. Transform coefficients are then grouped into non-uniform bands to reflect the human auditory system, and quantised on the basis of dynamic sensitivity and masking characteristics.

In other words, they remove all the bits you can't hear, and compress the remainder before writing it to the disc. As I said, this is a lossy compression algorithm, and while it's a lot better than, say, MP3, the audio quality can never match the perfect reproduction that CDs offer.

Sounds good, but how does it work?

Minidiscs use a magneto-optical system to store data. The disc's surface is made susceptible to magnetic fields by a high powered laser, which heats a tiny spot on the Minidisc's magnetic recording layer to its Curie point of 180°C.

While this is happening, a magnetic head on the other side of the disc writes the data to the heated area. When the disc's surface cools down, the disc is no longer susceptible, and cannot be overwritten or erased by stray magnetic fields. Playback is accomplished using the same laser at a lower power, taking advantage of the Faraday effect, in which the polarisation angle of reflected laser light is affected by whether it was reflected from an N or S magnetised region.

The MD optics detect these polarisation differences, and use them to reconstruct the recorded bit stream in much the same way as a CD player. That's all well and good, but how much is it all going to cost? Fancy Minidisc-based systems will set you back \$1000 - \$1500, but as they increase in popularity, prices will fall. They'll eventually replace tape as recordable media, and should start appearing in low-end systems within a year or so. The good news is that Minidiscs themselves are pretty cheap — around \$5-10 each, which compares favourably with better quality cassette tapes. ♦

The vertically-mounted CD player with its motor-driven sliding cover is very unusual, but nonetheless functional. This theme applies to the whole unit, really, with the radical design approach only creating the odd compromise in the button/labeling layout, making some functions tricky to access. The remote control's design is quite conventional though, with the only real salute to contemporary styling being its translucent case - gee, you can see the batteries...

system in terms of sound balance and overall fidelity. In a nutshell, the overall system sounds very good, and that's what's required.

Minidisc

The Minidisc performed exceptionally well, as expected. You just can't hear any difference between the CD and its Minidisc recording, and the recorder itself behaved flawlessly. It's great to see Minidisc systems finally becoming widely available in Australia, after this new format's low profile over the last five years or so since its introduction.

Using the Minidisc editing functions did highlight one compromise caused by the stylistic approach to the front panel design, and that's the constraints imposed by the button positioning and matching labeling. We had to refer to the manual (shock horror!) to figure out the correct button sequence for a number of the more obscure operations



(Minidisc track editing, stereo configurations, and so on), since these just weren't apparent from the panel layout. All of the common operations were quite straightforward though, and thankfully, the remote control's button/labeling layout is quite intuitive.

As an overall package then, Pioneer are clearly onto a winner with the IS-21MD. The unit attracted an almost embarrassing amount of attention from those passing the EA office, so in the marketing sense Pioneer have certainly achieved their aims with the system's bold styling. The look of the IS system may not be to everyone's taste, but at the very least, it's a generously-featured shelf sound system that performs extremely well. Chalk one up for the engineers... ♦

Pioneer's IS-21MD shelf system

Good points: Equipped with a MiniDisk. High output level for its size. Well-balanced sound, and lots of controls to play with.

Bad points: Control layout can be confusing. Speakers look a bit tacky, but that's a matter of personal taste.

RRP: \$1299 RRP, or \$999 for the IS-21T cassette tape version.

Available: Pioneer retailers. For more information, call Pioneer's toll-free consumer information line on 1800 060 6333, or check the Pioneer Australia website at <http://www.pioneer.com.au>.

Denon's DVD-5000 DVD/CD/HDCD Player



The new Denon DVD-5000 is very much a high-end DVD player, combining excellent build quality with circuitry offering outstanding audio and video performance. As well as playing DVD video discs, it will also play standard audio CDs and 24-bit/96kHz 'super hifi' CDs. For good measure, it can also fully decode the special 44.1kHz/20-bit 'compatible higher-fi' discs recorded via the Pacific Microsonics HDCD system, and is one of the few DVD players to achieve Lucasfilm's 'THX Ultra' certification...

by Jim Rowe

WHY WOULD YOU even consider paying \$4735 for a DVD player? It's a pretty hefty price tag in anyone's language, and about three times the price of most current models — even those offering a load of fancy features, and a level of performance that most people would already regard as excellent.

Clearly the new Denon DVD-5000 must offer some pretty impressive extra features and benefits, over and above the well-known and highly regarded Denon brand name, to justify that price tag. That's why I jumped at the opportunity of reviewing one, when the offer came along. It's not often that we ordinary mortals get a chance to examine this kind of rich person's status symbol...

The first thing you notice about the DVD-5000 is that it's **SOLID**. Although only a little larger than most other DVD players (434 x 374 x 135mm), it weighs a *lot* more: a whacking 16.5kg, in fact. That's about four times as much as the vast majority of DVD or CD players.

Most of the reason for that extra weight is a chassis and cover made from sturdy 1mm-thick sheet steel, with three further plates of

heavier 1.5mm-thick steel bolted under the bottom, and a similar plate inside the top of the cover. The front panel is also machined from heavy aluminium extrusion with matching end panels, instead of the usual plastic moulding. Presumably the idea of all this is to achieve a much more rigid and stable support for the player mechanism, as well as more effective shielding from external fields. (The chassis itself and all internal brackets are also heavily copper plated, which would again improve the shielding.)

Apart from the heavy reinforced case, there's also additional weight inside: in place of the single lightweight power transformer usually fitted, there are no less than *three* power transformers in the DVD-5000. Two of them are quite sizeable 'potted' components, used to power fully independent power supplies for the digital and audio sections of the player's main circuitry; the third transformer is a small PCB-mounting type used to power the 'standby' circuitry (to allow on/off power control via the remote).

The idea of totally separate power supplies for the digital and audio sections of the play-

er is to minimise hash, hum and other noise, of course.

Needless to say, the appearance of the DVD-5000 is very swish. The front panel has a satin gold anodized finish, with the same finish for the front of the player drawer and the various front panel controls. The main cover has a matching 'golden grey' finish, which appears to be a powder coating. The rear panel is finished in satin black, with a matching cover over the finned heatsink for the various power regulators, etc.

As you'd hope, though, the DVD-5000 is much more than a nicely finished heavy metal box. Inside there's a lot of impressive technology, delivering a level of performance that few other players can match — plus a fair amount of functionality. There is the odd omission, though, as I'll explain shortly.

First the video side. Although the DVD-5000 uses a 10-bit video DAC, which is nowadays pretty standard, in this case it operates at 27MHz and is described as a 'high speed, high precision' DAC giving improved definition, more faithful colour rendition and lower noise.

To allow you to take maximum advantage of this

high quality video, the player provides component video outputs (Y, Pb and Pr) as well as the usual S-video and composite video outputs. So if you're lucky enough to have a TV or projector with component inputs, you should be able to achieve pretty well the full video quality encoded on each disc. By the way, as far as I'm aware the 'Pb' and 'Pr' signals (also called 'Cb' and 'Cr') are essentially the same as 'Y-B' and 'Y-R', respectively.

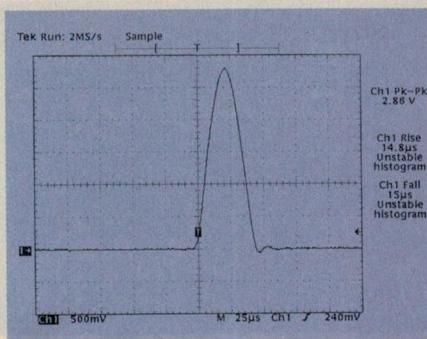
So there's actually a total of seven video outputs on the back of the DVD-5000: the three component outputs, two S-video outputs and two composite video outputs. Quite impressive, and obviously providing plenty of options. The player also handles both PAL and NTSC video, although the model sold here is nominally only capable of playing 'Region 4' movie DVDs...

Now for the audio side, and it's here that things get fairly complex. For a start, one of the special features of the DVD-5000 is its use of Denon's new AL24 digital audio signal processing technology, essentially an enhanced version of the Alpha Processing they developed for their highly regarded S1 series of reference-class audio components.

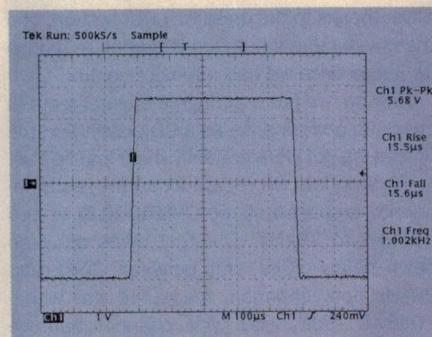
Technical information on the AL24 DSP system is pretty sketchy as yet, but as far as I've been able to work out it seems to be a digital interpolation system which synthesises an additional eight bits of lower-order waveform information, to effectively give the 16-bit audio a resolution of 24 bits. The DSP processor seems to do this by analysing the incoming 16-bit data for its rate of change on the least-significant bits, and then generating a further eight bits of data (on the fly) to 'smooth' these transitions digitally. The extra bits are then combined with the original data (as eight new lower-order bits), to provide a 24-bit version of the signal. And when this is converted back to analog audio via a 24-bit audio DAC, the result is a much smoother waveform with lower sampling noise and quantising distortion, and hence needing much less drastic analog filtering.

To achieve all this, the DVD-5000 needs not only Denon's proprietary DXP6001AF high speed DSP chip (which handles stereo signals, by the way), but also a set of four Burr-Brown PCM1704 high speed 24-bit audio DACs. These are exceptionally low noise, low-distortion DACs, and although they're capable of handling 8x oversampled 24-bit data at 96kHz(!), the player still needs two of them per channel to cope with the demands of the AL24 processor's output bitstream.

The end result is that the AL24 system delivers exceptionally clean stereo audio, from both DVDs and standard CDs. Quite apart from the lower noise and amplitude distortion, the phase linearity is also much better as a result of the reduced analog



As you can see from these measured waveforms, the impulse and square wave performance of the DVD-5000 are exemplary — indicating excellent phase linearity.



filtering. The rated S/N ratio is 118dB, with a dynamic range of 108dB and a total harmonic distortion (THD) of 0.0015% on DVDs (100dB and 0.0018% respectively for CDs).

By the way the AL24 processor automatically senses the type of digital audio information reaching its input, and processes them accordingly. So if the information is already in 24-bit form (from say 'super hifi' 24-bit/96kHz audio CDs, or audio DVDs), it doesn't synthesise the additional low-order bits.



Just to the left of the disc tray there's a switch which lets you use the internal AL24 processor and DAC to decode external bitstreams.

Perhaps the best way of summarising the benefits of AL24 processing is that it gives the DVD-5000 the ability to provide exceptional 24-bit stereo sound (or two channel mixed-down sound) from virtually any incom-

ing bitstream — whether it's originally of 16, 18, 20 or 24 bits per sample, and with any of the usual sampling rates up to 96kHz.

Quite apart from this AL24 processing, the DVD-5000 also provides an inbuilt decoder for the HDCD (High Definition Compatible Digital) system. Developed by Californian firm Pacific Microsonics a couple of years ago, HDCD is a digital encoding system which effectively allows 'higher-fi' 20-bit audio to be recorded on CDs, in a way which still retains compatibility with standard CD players. HDCD is now being used for recording an increasing proportion of premium-grade CDs.

The important element about HDCD is its compatibility with standard CD players. Although discs with HDCD encoding have additional information on them, they can still be played on normal players as if they were high quality standard 16-bit recordings. However on a player fitted with an HDCD decoder, they deliver what is effectively 20-bit resolution and dynamic range.

This is achieved by encoding the additional peak and low-level range extension information as inaudible pseudo-random code, modulating the least significant bit of the 16-bit audio. The extra coding is simply filtered out and ignored as supersonic noise in a 16-bit player, but extracted and used very effectively in a player with HDCD decoding, to deliver higher quality reproduction.

The DVD-5000 has a Pacific Microsonics PMD-100 HDCD decoder chip on board, so it's fully capable of delivering the effective 20-bit resolution from HDCD discs. And while there may not be a huge number of these available just at present, they're certainly coming along.

As you've probably gathered, both the AL24 processing and HDCD decoding in the DVD-5000 essentially provide only two channels of analog audio, albeit of very high quality. What about DVDs with multi-channel surround sound, I hear you ask — like Dolby Digital 5.1, DTS or MPEG2?

No, there's no inbuilt multi-channel surround decoding, just the usual 'bare bones' decoding to deliver the 'mixed down' two-channel outputs. Presumably even Denon's designers balked at the prospect of providing the full kaboodle, and then having to provide another 3.1 channels of AL24 processing as well! Instead they've just provided the usual digital and optical bitstream outputs, to drive external multichannel decoders. Of course in most cases you'd also be able to feed the two-channel audio from the AL24 processing and DACs

into an external Pro Logic or Hafler-type analog decoder, to get four-channel surround sound...

Another special feature of the DVD-5000 is that as well as providing digital and optical bitstream outputs, it also provides a matching

pair of bitstream inputs. The idea of these is that they allow you to feed in a bitstream from other digital audio sources — like a DAT player or MiniDisc recorder — and take advantage of the player's high quality AL24 processing and precision 24-bit DACs. In other words, this part of the DVD-5000 can be used as a high-performance outboard DAC subsystem.

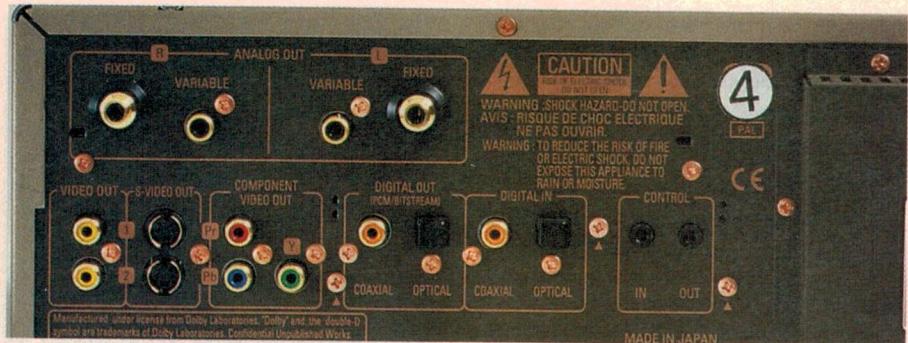
As a result of the exceptional video and audio performance of the DVD-5000 as a DVD player, coupled with its intuitive operation (thanks to an on-screen GUI), it has been certified by Lucasfilm Inc as surpassing the THX Ultra' specification — the latest version of Home THX. So it's fully endorsed for high-end home theatre use.

What else should I mention? Well, the designers of the DVD-5000 seem to have gone to a lot of trouble with its circuitry, to ensure a very high level of performance. In addition to the fully separate power supplies noted earlier, there are big, well laid-out PC boards, with fat supply rail tracks and extra above-board busbars; and also a large number of low-ESR bypass and filtering capacitors, to minimise hum and noise. Virtually all of the signal connectors are gold plated, too.

Additional facilities and functions include both fixed and variable line-level analog audio outputs; indicator LEDs on the front panel to show when AL24 processing is enabled, or HDCD is being decoded; and as noted earlier, the ability to turn the player on and off via the remote control — which is pretty big, by the way (232 x 68 x 18mm). A nice extra feature of the remote itself is built-in backlighting for all the main control buttons, which turns off automatically after about six seconds.

Outstanding specs

We were a little behind the eight-ball when it came to reviewing the sample DVD-5000, because it came to us straight from another magazine (not an electronics magazine), which had somehow managed to 'lose' the English version of its user manual, the remote control and *all* of the connecting cables. So there was a short delay until the distributors provided a replacement remote control; but apart from that, we had to 'wing it' with our own cables, and a bit of guess-



Among the rear-panel connectors there are variable analog audio outputs (top) as well as the usual fixed outputs, plus component video outputs — and also digital bitstream inputs as well as outputs.

work based on the Japanese user manual...

Luckily the DVD-5000 is very intuitive to drive, thanks to the on-screen GUI system, and there was no real problem in putting it through its paces once we had a remote control.

First up, we put it through the usual tests to check its performance as a CD player. And the figures we got were certainly *most* impressive.

For standard CD reproduction the rated frequency response of the DVD-5000 is stated as '2Hz to 20kHz'. Our test discs don't go down below 20Hz, but between 20Hz and 20kHz both channels measured flat within +0dB/-0.25dB, and with channel balance within 0.05dB — essentially 'ruler flat', and an excellent result.

The noise level was less than our instruments could measure reliably, but we can still say that the S/N ratio and dynamic range were 'better than 100dB'. The same figure applies to the channel crosstalk, too, which is again excellent. Not only that but the output linearity was measured at essentially ruler flat (within 0.1dB) right down to the -90dB level, and gave every indication of continuing below -100dB.

We were also most interested in checking the impulse and squarewave response, because that's the area where phase non-linearity shows up. Most CD and DVD players exhibit a fair bit of ringing on impulse and squarewave signals, because of the phase errors introduced in their post-DAC analog filtering.

Frankly the response of the DVD-5000 to these test signals almost blew us away, because as you can see from the DSO plots it showed virtually *no* ringing at all! This is an out-

standing result, and along with the excellent noise and amplitude linearity really shows the benefits of Denon's AL24 processing system.

Following these tests we put the DVD-5000 through a lengthy series of subjective listening and viewing sessions, using both our usual set of reference CDs and a range of DVDs — mainly region-4 coded PAL movie discs, but also the Video Essentials 'all regions' NTSC test disc. For the video testing we mainly used a Sony KVJ29SZ9 68" Trinitron receiver, with S-video drive.

We weren't able to get hold of an HCD disc, unfortunately.

As you'd hope and expect, the performance proved to be outstanding in virtually all respects. The audio quality from both CDs and DVDs was absolutely first rate, with a clarity and transparency that allowed listening for hours on end without any auditory fatigue. And the video quality from DVDs was equally excellent, giving every indication of being limited purely by the software itself. Even with the S-video output we were getting only a small amount of colour fringing on the Snell & Wilcox 'moving zone plate' test pattern; presumably even this would have disappeared with component video drive.

Overall, then, the Denon DVD-5000 is without doubt a superb CD and DVD player, and offers true 'reference quality' performance not just for video, but also and especially for audio — thanks to that AL24 24-bit processing. Coupled with its ability to play next generation 24-bit/96kHz 'super CDs' and decode the new HDCDs, these features make it a very impressive beast indeed.

Whether all these benefits make it worth that whopping \$4735 price tag is a question that can only be answered by individual buyers, of course. It still seems pretty pricey to us, especially when you consider the player's lack of inbuilt multi-channel surround decoding. But if money's no object and you already have a top grade Pro-Logic surround amplifier/receiver, and a big-screen TV fitted with component video inputs, the DVD-5000 would certainly deliver you outstanding home theatre performance. ♦

Denon DVD-5000

A 'reference quality' CD and DVD player offering the ability to play standard CDs and DVDs with 24-bit resolution, plus the new HDCD 'higher-fi' compatible discs and also future 24-bit/96kHz super-hifi CDs and DVD audio discs.

Good Points: Outstanding video and (especially) stereo audio reproduction, via Denon's proprietary AL24 DSP system; excellent build quality; and the ability to use the AL24 processing and precision 24-bit DACs to convert external bitstream sources.

Weak Points: For the price, it's a little disappointing that multi-channel AC3, DTS and MPEG2 decoding are not built in.

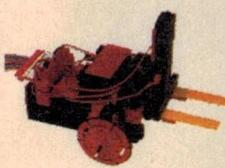
RRP: \$4735.

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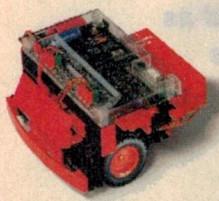
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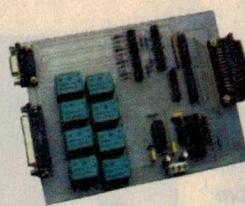


30520 Parallel port interface unit. Provides 4 motor outputs, 8 digital inputs and 2 analogue inputs. Also provided is a special plug unit and software drivers for BASIC, C, Pascal & VisualBASIC. \$164.80 ex-tax. \$189 inc-tax.

30402 Intelligent interface unit (shown above). Plugs into any coms port. Same capability as 30520 but allows stand-alone control without computer. May be controlled directly from the computer using most languages or 'down-load' a program using LLWIN (sold separately). \$232 ex-tax. \$265 inc-tax.*

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30403	LLWIN for 30520 interface	\$69 *
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OzPoz:

Making the most of the Very Large Telescope

OzPoz is a specialised robot arm that will be used to maximise the use of the Very Large Telescope (VLT) currently under construction in South America. Recommended as part of the Australis Report, OzPoz will accurately position optical fibres within the telescope, allowing up to 400 separate observations to be carried out at once.

by Geoff McNamara

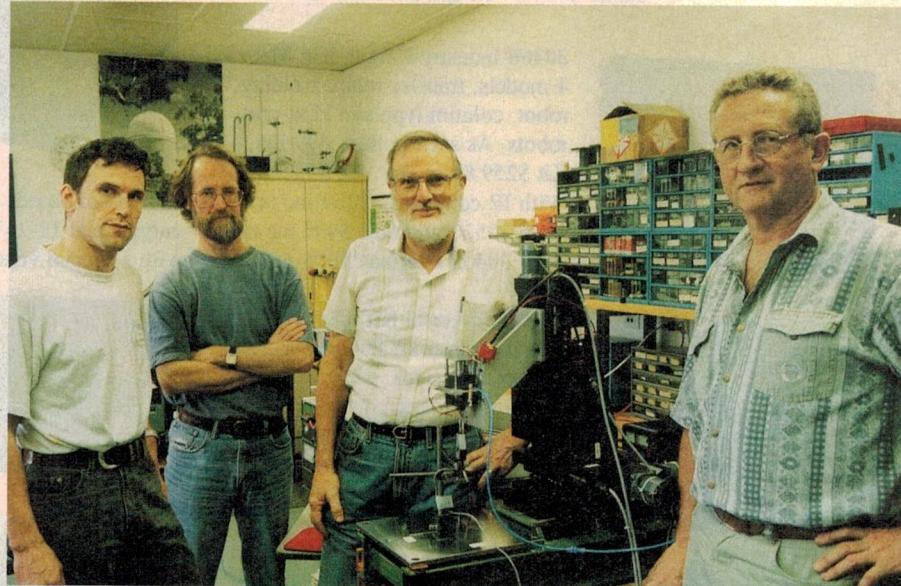
FOR SEVERAL DECADES NOW, scientists and engineers at the Anglo-Australian Observatory (AAO) have been world leaders in the application of optical fibres in astronomy. Their efforts have recently culminated in the construction of 2dF, a giant fibre positioner and spectrometer that rides on the front end of the 3.9 metre Anglo-Australian Telescope (AAT, see EA September 1995).

Now the AAO has been commissioned to build a fibre positioner for the world's biggest telescope, the Very Large Telescope being built in the Chilean Andes by the European Southern Observatory (ESO). The new instrument, dubbed 'OzPoz', will allow the giant telescope to survey up to 400 objects at a time, maximising the use of cherished observing time.

The reason why instruments like 2dF and OzPoz are becoming so important is simply that the world of astronomy is such a competitive place. The most modern telescopes are larger and more sophisticated than anything even dreamed of at the beginning of the twentieth century, and they have continued to push the limits of how far into the universe they can see.

So, at any given distance, a modern telescope can see more examples of any one type of object. This may seem a boon to scientists — after all, the more samples you can study the better. But such telescopes are not cheap, and compared with the number of astronomers in the world there are very few of them, resulting in a backlog of observation requests.

Taking just one example, one of the hot topics in astronomy at the moment is the three-dimensional mapping of the Universe. Creating such maps is important for a wide range of cosmological problems, ranging from determining the origins of the Universe



The OzPoz team (left to right): Stan Miziarski, Peter Gillingham, Keith Taylor, Urs Klauser. (Photo courtesy Geoff McNamara)

to how much matter it contains.

To make such a model requires observations of thousands of individual galaxies, the basic building blocks of the cosmos. Since many of these galaxies are so distant and faint that they require hours of telescope time to collect enough of their feeble light to enable a meaningful analysis, observing them one at a time is a tedious and expensive procedure.

The only solution to this type of data collection problem — and there are dozens of others — is to make telescopes more efficient. This is exactly what 2dF and its predecessors have done for the AAT.

Optical fibres

The basic idea is that, rather than use a telescope to collect the light from individual objects one at a time, instruments like 2dF use carefully positioned optical fibres to collect the light from many objects simultaneously, feeding it into spectrographs mounted on the telescope itself. Since the observing time required is reduced by the number of fibres available — in the case of 2dF, that number is 400 — it's not hard to see why the use of optical fibres in this way is an extremely attractive proposition to other observatories.

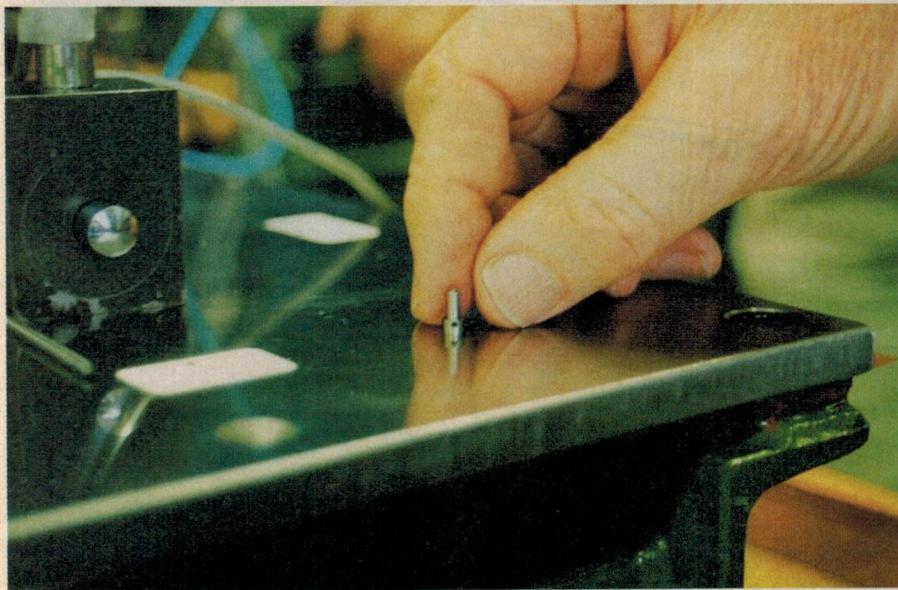
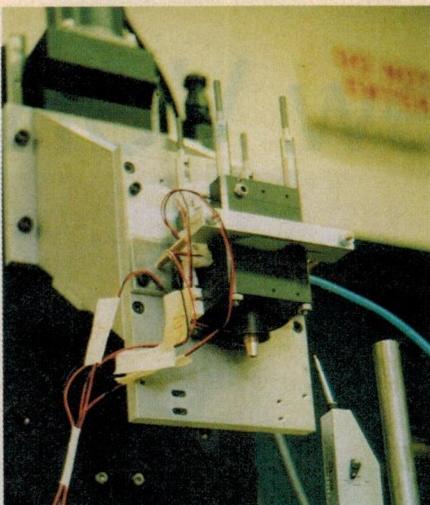
In fact, the success of 2dF is largely respon-

sible for maintaining the AAO's status in the astronomical community. The 3.9 metre AAT faces the risk of being dwarfed by such behemoths as the Very Large Telescope (VLT) and the twin ten metre Keck telescopes in Hawaii. But rather than being threatened by these latest instruments, the AAO has gained an international reputation as a leader in the use of optical fibres. It was this reputation that led to the contract for OzPoz.

OzPoz — an abbreviation of 'Australian Positioner' — will follow in 2dF's footsteps, carrying out a similar task as 2dF on one of the four 8-metre telescopes that make up the VLT (see EA February 1995). The use of optical fibres on the VLT wasn't an obvious decision, however. There is a strong history in Europe of studying the Milky Way Galaxy, and

Right: This is a prototype of the OzPoz gripper that will eventually be used to position the hundreds of optical fibres on the imaging plate for the VLT.

Below: Each optical fibre is attached to a small metal button that gives the gripper something to grip when relocating the fibres. Being magnetic, it also holds the fibre tip in place on the imaging plate during the observing session.



so the VLT's instrumentation, specifically its spectrographs, were built for that purpose. But around the time 2dF was nearing completion, the ESO was becoming increasingly conscious of the lack of capability they were building into the VLT to study cosmological problems (that is, studying objects well beyond the Milky Way to the Universe at large).

To study the problem, they commissioned a team from the AAO, Mount Stromlo and Siding Spring Observatory, and the University of New South Wales to report on the best option for them. The result was the Australis Report, which suggested a 580-fibre optical and infrared spectrograph that could be mounted on one of the 8-metre telescopes. The ESO already had a 120-fibre spectrograph underway, and so rather than abandon

the project altogether, they decided to adopt part of the Australis proposal — namely the fibre positioner, later to be dubbed OzPoz.

OzPoz's task will be to pick up the tips of individual optical fibres and position them on a horizontal plate. When in use, the telescope produces an image of a tiny patch of the sky. This image — along with the tiny images of stars or galaxies or whatever is being studied at the time — will be projected onto the plate.

The optical fibres are then positioned so that light is channelled from the plate into the spectrograph where it can be dispersed and studied in detail. It will be the job of OzPoz to pick up the fibres one at a time and position them at exactly the location of the image of a star or galaxy. The accuracy of the positioning is all important, since any

error means valuable starlight will fall outside the fibre and will therefore be wasted.

The scientist in charge of the project is Keith Taylor, who is also deeply involved in the 2dF project. Taylor points out that, in many ways, designing and building OzPoz is a simpler problem than 2dF, despite the fact that OzPoz will be used on a telescope four times the size of the AAT.

For one thing, 2dF has to operate while being carried around the sky at the top of the AAT — a slow but wild ride for a precision instrument — carefully positioning the fibres on one plate while a second plate is in use collecting light. OzPoz, on the other hand, will sit at what's known as the Nasmyth focus of one of the VLT's telescopes, a horizontal platform that rotates about a vertical axis with the telescope but never tilts nor moves vertically.

Further, the image scale of the VLT is larger than 2dF: rather than having a two degree patch of the sky crammed into a 500mm diameter plate as is the case with the AAT/2dF combination, OzPoz only has to contend with a half of a degree spread over an 800mm diameter surface. This means that the number of arc seconds per millimetre is in the order of ten times less than the scale 2dF has to deal with, which of course means you don't have to be as accurate.

This is countered by the fact that an 8-metre telescope is capable of seeing some pretty faint objects, and that means more of them... thousands more. Depending on what you're studying at the time, you may not want to look at that many objects, but then again you might. Designing an instrument to cater for such a wide range of interests is not easy: you may get a few objects for one type of survey and thousands for another type of survey. Compromise is inevitable, "and that compromise is usually driven by technology, not by science", Taylor points out.

While migrating beyond 400 fibres is technologically enormously difficult, Taylor points out that 400 fibres is still well ahead of the competition. "There is a significant flow on from 2dF expertise. However, in detail the concepts are different and more refined. We have a very talented engineer, Peter Gilliam, who used to work for Keck, who looked at 2dF with new eyes, and said 'Well, how am I going to do this better, simpler, because we have to do this to a budget and make a successful enterprise out of this'. So simplifying the engineering, streamlining it, and learning from the mistakes we made on 2dF is a very important component to all this work," Taylor said.

At this stage, the various OzPoz components are still in the prototype development stage, such as the gripper that will gently pick up the fibres and position them on the imaging plate. The instrument is due for acceptance testing in mid-2001, but Taylor is confident of success: "If we can do 2dF, we can do OzPoz!" ♦

Smart new VCR

can navigate your tapes



Like many of the latest up-market consumer VCRs, Hitachi's new top of the line VT-FX8000E offers nice features like extra heads, HiFi stereo sound, multistandard compatibility, easy G-Code programming, picture enhancement and auto head cleaning. But this one also provides a new Tape Navigation System, whereby all you have to do in order to play a particular recording on your tape is select it from an on-screen menu...

by Jim Rowe

GUESS IT'S understandable that makers of domestic analog VCRs are trying to pack more features and functions into their models, now that things like digital camcorders and DVD players are available to give people a taste of the digital video and audio future, and what it will bring in terms of better pictures and sound. Small wonder they're finding ways of packing in more bells and whistles, to provide added value.

Hitachi's new VT-FX8000E is a good case

in point. It provides just about all of the functions and features that have been introduced in recent years to jazz up domestic VHS recorders, including a few that were originally found only on professional gear. Then as an added bonus, the designers have thrown in some more features again — including a new Tape Navigation System, to simplify management of your recordings. More about this shortly, though; let's look first at some of the more familiar functions and features.

The FX8000E is a six-head HiFi stereo machine, with two of the rotating heads used for SP video recording and playback, two for LP/EP and the remaining two for the HiFi audio. It's also a multi-standard machine, able to record and playback not just in standard PAL (B/G) but also in NTSC (both standard 3.58MHz and 'modified' 4.43MHz) and MESECAM (B/G). It can even replay NTSC recordings in PAL60 (60Hz PAL) format, for playing on PAL-only receivers.

In PAL and MESECAM it can record and play in both SP (23.39mm/s) and LP (11.7mm/s) tape speeds, while in NTSC you have a choice of SP (33.35mm/s) and EP (11.12mm/s) for recording and playback — plus LP (16.67mm/s) for playback only. How's that for flexible!

Needless to say there's a built-in synthesised TV tuner, which incorporates automatic station searching and memory tuning. Also included is a digital stereo TV sound decoder for the German (Zweiton) A2 sound system used by Australian TV stations — so if a movie or programme is being broadcast in stereo, the FX8000E will be able to record stereo sound off-air.

While we're on the subject of off-air recording, it also incorporates the Gemstar G-Code system, whereby you only need to enter the appropriate ID code (as published in programme guides) in order to program it for recording a particular TV show or movie.

Some of the other nice features include HQ picture technology, further enhanced with Hitachi's own Dynamic Picture Enhancement; what they call Super rewind and fast forward, which provides speeds of up to 250x for very fast operation (about 2 minutes maximum to rewind an E-180 tape); a true 'jog shuttle' control, with six graduated speeds in either direction (1/7x, 1x, 3x, 5x, 7x and 9x) plus frame-by-frame, and most of the functions duplicated on the remote control as well as the front panel; automatic and manual tape head cleaning; automatic tracking; video and stereo audio inputs at both front and rear; and an on-screen display (OSD) system which uses a graphical user interface (GUI) for easy and intuitive operation.

It also comes with a very powerful IR remote control, which not only allows you to control virtually all VCR functions (including tape eject, source select etc.) but also includes its own real-time clock and calendar which is automatically synchronised with that in the VCR. So even when the VCR is not in use you can always see the time on the VCR's own LCD, and both the time and date on the remote's LCD — very handy.

Then there are the FX8000E's special features, including a built-in decoder for the Closed Captions which are nowadays available on many pre-recorded movie tapes (and broadcast TV programmes), to provide subtitles for the hearing impaired and those watching a movie in a different language. The captions can be positioned near the bottom of the screen, the top

By simply selecting any entry in the on-screen tape index using the up/down arrow keys, and then pressing the Play button, the FX8000E will quickly shuttle forward or back to locate the start of that recording, and start playing it...

of the screen or scrolling continuously.

But the biggest 'special feature' of the machine is its Tape Navigation System, as mentioned earlier. This gives the FX8000E the ability to keep track of up to 200 of your recordings, on many different tapes, and allows you to access them quickly and easily when required.



As well as a jog shuttle and all of the usual transport controls, the FX8000E's remote control provides its own real-time clock and calendar, which is automatically synchronised to that in the VCR itself.

It works like this. When you make a recording, on either a blank tape or a blank section of a tape containing some of your other recordings, the FX8000E saves all relevant data in its internal memory: tape ID number (which it allocates), recording (i.e., track

number (which can later be replaced by various icons, for convenience), the recording date, the TV channel or direct AV input source, the time the recording started, its duration and the recording mode (SP/LP/EP).

Then after recording — and also whenever you load that tape back into the machine — you can view an on-screen index of the recordings on that tape, simply by pressing the 'NAVI' button on the remote or the corresponding button on the front of the VCR. The index even shows whether the recording concerned has been viewed since recording, along with both graphical and numerical indications of the space on that tape still left for further recording.

Not only that, but by selecting any of the entries in the index using the up/down arrow buttons, and then simply pressing either the Play or Stop buttons, the FX8000E will quickly shuttle backward or forward to locate the start of the desired recording, and either begin playing it immediately or stop ('cued up') to await your further instructions.

As you can imagine, this facility should make it much easier for anyone with a fairly large number of video recordings and tapes to keep track of them all. The VCR does all of the indexing for you, storing the information in its internal non-volatile memory (presumably flash or ferroelectric RAM), removing the need for paper labels and/or separate indexing system that have to be maintained.

Of course the ability to select any of the recording 'tracks' on a tape and have the VCR cue up and play them with little more than a couple of key presses is also very convenient. It certainly gives the FX8000E at least some of the 'random access' functionality we've all come to appreciate with CDs and DVDs, and should also make the machine quite attractive as a 'source' for video editing. (The ability to replace the 'track numbers' with your choice of 11 different pictorial 'icons' might come in especially handy for editing, too.)

Mind you, the navigation system does have a few limitations. Basically it will only work with tapes recorded from scratch on the same machine; not with pre-recorded tapes, or those recorded on other machines. And although it will work just as well with NTSC recordings as well as PAL, you can't mix the two on the same tape; this gets it all confused. Not that many people are ever likely to want to mix the two on the one tape, of course.

Another limitation is that the navigation

system will only function with recordings of more than five minutes in length. This might be a disadvantage for editing work, or for people who collect movie trailers and try to record quite a few of them on the one tape...

The FX8000E is a fairly large machine, measuring 435 x 272 x 99mm and weighing 4kg. The case has a handsome 'shades of gold' finish, with a protective clear plastic escutcheon over the lower half of the front panel. A small swing-out door at the top left of the panel hides the front AV inputs when they're not in use.

Trying it out

Hitachi Australia kindly loaned us an evaluation sample of the FX8000E, allowing us to try out its performance and features for ourselves. Needless to say we first tried making a number of recordings and playing them back, in both PAL and NTSC, using source material both off-air and from reference DVDs.

Frankly we were very impressed with the basic video and audio performance, both with these record/replay tests and then simply playing pre-recorded VHS tapes with HiFi stereo tracks and known good picture quality. The picture quality was of a very high standard, with barely perceptible noise and ringing — just

about as good as you can get from VHS — and the stereo sound was of a similar standard.

Out of interest we tried recording a sequence of audio response test tracks, and the results were very impressive. The specs said the response was from 20Hz to 20kHz, and we got figures showing a very smooth response which was only 0.3dB down at 10Hz, then flat within 0.1dB to about 7kHz, 1dB down at 12kHz and then a gradual roll off to -2.8dB at 20kHz. Comfortably within spec, in other words. The signal to noise ratio was also very good too, although we weren't able to achieve the quoted 90dB of dynamic range.

After we'd done a number of different test recordings on a new tape, we were able to try out the tape navigation system. We found it not only easy to use, but also quite effective, too. It's surprisingly fast and accurate in searching for the track you select, and then playing it.

Other things we liked about the FX8000E included its easy setup using the on-screen menu system, the multi-speed jog shuttle, the ability to not only record and play NTSC but also play it back in PAL 60 format if desired, and the handy real-time clock and calendar in the remote.

But of course the big feature of the machine is the tape navigation facility, and this really does work well. ♦

Hitachi VT-FX8000E

A multistandard six-head HiFi stereo VCR offering G-Code programming, built-in A2 stereo and closed captions decoders, plus a novel Tape Navigation system.

Good Points: Excellent video and audio performance, with both PAL and NTSC; the tape navigation system works very well, for recordings of more than 5 minutes; full jog shuttle capability; nice clock/calendar facility in the remote.

Weak Points: Very little. Perhaps more internal memory would allow the navigation system to cope with shorter recordings and more of them.

RRP: \$749.00

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Cat. 5646	Citizen IDP3545 40 Column Parallel	\$530
Cat. 5647	Citizen IDP3545 40 Column Serial	\$540
Cat. 5648	Citizen IDP3546 40 Column Parallel	\$610
Cat. 5649	Citizen IDP3546 40 Column Serial	\$630
Cat. 5673	Citizen IDP3550 40 Column Parallel	\$540
Cat. 5674	Citizen IDP3550 40 Column Serial	\$570
Cat. 5675	Citizen IDP3551 40 Column Parallel	\$640
Cat. 5676	Citizen IDP3541 40 Column Serial	\$670

Citizen Cash Drawers



The Citizen Cash Drawer model CBM-3585DR features 8 coin drawer / 5 note insert for IDP35XX series printers. A key is provided to open it in case of power failure.

Model GC-33/5 is a heavy duty cash drawer with 9 coin (adjustable) / 5 note insert removable, 3 position key-lock, emergency key opening, available with modular connector. Model GC-52/5 is a large heavy duty cash drawer.

Cat. 8243	Citizen Cash Drawer CBM-3585DR	\$186
Cat. 8523	Citizen Cash Drawer GC-33/5	\$195
Cat. 8321	Citizen Cash Drawer GC-52/5	\$230
Cat. 8759	Citizen Cash Drawer GC-55/5	\$230
Cat. 8760	Citizen Cash Drawer Compact GC-28	\$115

POS Customer Display



This POS customer display is driven from the serial port and has a vacuum fluorescent display with two lines of 20 characters. It is ergonomically designed with a 270 degree viewing angle.

Cat. 8728 POS Customer Display \$369

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Cat. 3359 Year 2000 BIOS Card \$129

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Cat. 8356 55 Key POS Keyboard \$39

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Cat. 8755 POS Touch System with LCD & Swivel Base \$4,900
Optional add-ons include a magnetic card reader, a magnetic I-Button reader with 5 operator keys for security access, an external FDD kit, Customer Display and cash drawers.

Cat. 8756	POS Touch System MCR Track 2	\$299
Cat. 8757	Magnetic I-Button Reader + 5 keys	\$190
Cat. 8758	External FDD Kit	\$219
Cat. 8728	POS Customer Display, Serial Connection	\$369

Intelligent LAN Cable Testers

You can simply plug your UTP cable straight into the box for instant identification of pinouts with the combined tester & breakout box model. It also tests both UTP/STP &

BNC cable. Both models feature a 2 line by 16 character LCD display.

Cat. 11517	Intelligent LAN Cable Tester & Breakout Box	\$279
Cat. 11518	Intelligent LAN Cable Tester	\$229
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Cat. 11515	Network Multi Modular Cable Tester Pro	\$169
Cat. 11512	Network Multi Modular Cable Tester	\$119
Cat. 11516	Network Cable Tester Enhanced	\$99

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Canon's colourful Multipass C50 MFC

The Multipass C50 is for those who want the convenience of a 'multi-function centre', but also need to be able to print, scan and copy images and documents in full colour.

by Jim Rowe

CLEARLY IN THE 'second tier' of multi-function centres (MFCs), Canon's Multipass C50 combines the functions of a fast fax machine with a colour printer, scanner and — especially interesting — a digital colour photocopier with very close to photographic quality (when you use the right ink cartridge and paper). It should therefore be of potential interest to anyone running a small or home office, who wants to take advantage of the space- and cost-saving aspects of an MFC, but also needs colour printing, scanning and copying capabilities.

The specs of the C50 are quite impressive. First of all, it's a pretty nimble G3-compatible fax, with a top modem speed of 14.4kb/s and built-in MH, MR and ECM-MMR compression. In conjunction with a 672KB data memory (sufficient for about 42 typical pages) this allows potential transmission and reception speeds (from/into memory) of about six seconds per page, to minimise STD and ISD faxing costs.

Thanks to the inbuilt Bubble Jet printer, the C50 prints faxes on either A4 or letter size plain paper at about four pages per minute. For scanning the originals for transmission it uses the Genesis/UHQ system, and provides 256 levels of grey. Horizontal resolution is 8 pels/mm, with 3.85 lines/mm in standard mode and 7.7 lines/mm in fine mode. Scanning width is 208mm. The printer section has a vertical feeder with a capacity of up to 100 sheets of 75g/m² plain paper (up to A4/letter), while the scanner has a similar feeder with a capacity of 20 sheets.

Needless to say the C50 can be used not only as a free-standing fax, but also hooked up to your PC as part of its MFC capabilities, as a PC-driven fax. This allows you to use the bundled *Multipass Desktop Manager for Windows* software to facilitate faxing direct from PC applications, save incoming faxes on disk and view them on-screen, send 'broadcast' faxes to a list of numbers, maintain fax/phone address books, etc.

The C50 links to the PC via an IEEE 1284

compatible bidirectional printer port, by the way, using this for all data flow in either direction. The software is compatible with Windows 95 and 98, runs on a 486 or better and needs at least 16MB of RAM and 17MB of hard disk space.

Not surprisingly you can also use the C50 as a Windows-compatible printer, with a resolution of 720 x 360dpi and a maximum print speed of about five pages/minute when printing in B&W. It accepts a range of Canon's Bubble Jet ink cartridges, including the BC-20 black-only model, the BC-21/21e colour and black model, the BC-22e 'Photo' colour model and even the BC-29F fluorescent colours model. It also accepts a wide range of print media, from plain paper through coated, glossy and 'glossy photo' paper, to overhead projector film and fabric.

In short, as a printer it has virtually all of the capabilities of Canon's regular Bubble Jet colour/B&W models, and is therefore suitable for a very wide range of PC printing tasks.

Similarly the scanner section can be used as a Windows-based colour graphics scanner, again with quite respectable performance. The basic scanning resolution is 300dpi, with effective resolution selectable between 30 and 600dpi from within a TWAIN application. UHQ image processing provides 256 levels of grey for monochrome images or 16.7 million colours for colour.

Scanning time for a typical A4-size image or page varies from about nine seconds for 150dpi text scanning to around 234 seconds for 600dpi colour image scanning. This doesn't include the time to transfer the data to the PC, though; just the actual scanning time. Needless to say the scanner can only handle 'single sheet' originals, of the type which will pass through its fixed-sensor sheet feeder.

As with most MFCs, you can of course use the scanner and printer sections of the C50 together as free-standing photocopier. However the nice part is that in this case, and providing you have the right ink cartridge fitted

and are using the appropriate paper, you can do colour photocopying — and of surprisingly good quality. Essentially the scanning and printing resolution are both 360 x 360dpi, with grey-scale and full colour capability.

Copying speed varies from 20 - 45 seconds for a B&W copy up to about nine minutes and 44 seconds for a full A4 size copy in COLOUR FINE mode (i.e., hi-res full colour copying). As well as 100% copying you can also select 90%, 80% or 70% reduction, and for B&W copying you can have up to 99 copies.

Other features of the C50 include a 16-character LCD display for showing your dialling number, machine status, etc; one-touch speed dialling (6 locations), coded speed dialling (50 locations) and group dialling (55 locations); an 'economy' print mode for saving ink when printing faxes; and automatic phone/fax switching for incoming calls. Along with the bundled Desktop Manager for Windows it also comes with Corel's Print House Magic graphics package on a second CD-ROM, with Corel Print House 3 and Photo House 2.

In fact about the only function that the C50 doesn't provide, compared with other MFCs, is a built-in phone handset. The basic unit simply provides a second RJ-11 modular socket, to connect your own phone. However a matching handset and cradle are available from Canon

**The nice part is that in
this case you can do
colour photocopying
— and of surprisingly
good quality**



as an optional accessory, if you prefer.

The basic dimensions of the C50 are 400 x 365 x 205mm (less trays, guides and optional handset cradle), and it weighs approximately 5.6kg.

Trying one out

Canon Australia kindly made a new Multipass C50 available to us for evaluation, and we were able to put it through its paces over a period of a few weeks. Needless to say we were interested to try it out not only in conjunction with a PC, but also as a free-standing fax and (especially) a colour photocopier.

Assembly and setup of the C50 itself was quite straightforward, and the Desktop Manager for Windows software seemed to install quite quickly and without problems on an HP Pavilion 6305 (K6 266MHz) PC, running Windows 98.

After that we had no trouble printing out on the C50's Bubble Jet from a number of different applications, and the results were most impressive. In fact we tried printing out some hi-res full colour TIF image files, using the sample BC-22e 'Photo Colour' ink cartridge and GP-301 Glossy Photo paper, and the results were excellent — showing that the C50's printer is easily capable of very satisfying photo-quality colour printing.

We didn't have as much success using the scanner section of the C50 with Windows apps, though. We could make quite good B&W scans using the ScanGear utility in Canon's own Desktop Manager for Windows, but as this isn't capable of colour scanning, we had to try using another application such as Adobe Photo Deluxe, via the TWAIN link. Here we couldn't get any joy either, because all we kept getting was an

error dialog saying "Error Starting Program: a required .DLL file, CPPENV25.DLL was not found". This was a bit puzzling, since the complete suite had appeared to install quite happily from the supplied CD-ROM!

Anyway, we proceeded by trying out the C50 as a free standing fax, and here it again performed very creditably. Transmission and reception speeds were brisk, and the greyscale reproduction was quite good both ways.

Then we came to trying it out as a colour photocopier, and here the results were most impressive. Using the BC-21/e colour/B&W ink cartridge and GP-301 Glossy Photo paper, we were able to make excellent copies of both large and small glossy colour prints in Colour Fine mode. The 360 x 360dpi scanner and printer resolution is more than adequate, especially as the C50 seems to use a stochastic screening system which gives excellent greyscale and colour resolution.

Colour accuracy was not quite as good, with small errors discernable from time to time, but basically the results were very good indeed.

Overall, then, we were quite impressed with the MultiPass C50. It works well as a plain paper 14.4kb/s fax, both freestanding and PC-driven, and also gives excellent results as a 360 x 360dpi Bubble Jet colour printer and (presumably) as a colour scanner — once you have the missing DLL. Plus you have the added bonus of colour photocopying. Of course the results possible with this kind of 'fixed sensor/moving original' scanning system can never be quite as good as with a flatbed or drum scanner, but considering this it really seems capable of giving very respectable results both scanning and copying.

For the quoted RRP of \$799, though, we're still a bit disappointed that the telephone handset and cradle are an 'optional extra' rather than supplied as standard. ♦

Canon MultiPass C50

A desktop multifunction centre (MFC) offering colour printing, scanning and photocopying as well as G3 compatible monochrome B&W/greyscale fax transmission and reception.

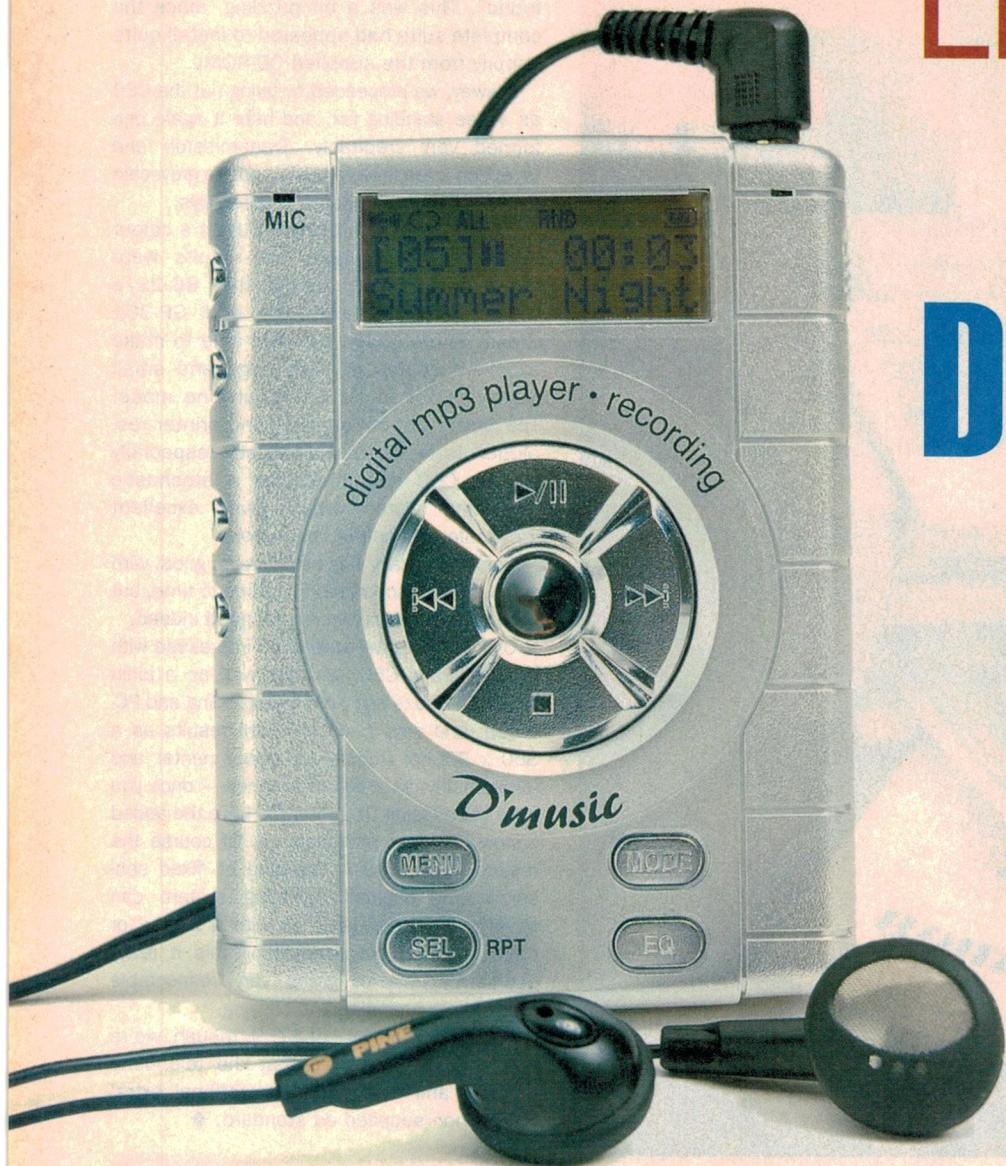
Good Points: High quality colour printing and photocopying using Canon's Bubble Jet engine; fast 14.4kb/s fax operation; ability to interface with Windows 95/98 PC for automation of many functions.

Weak Points: Phone handset and cradle not supplied as standard, but as 'optional extra'.

RRP: \$799.

Available: Canon dealers and office equipment retailers. For more information call Canon's Customer Care Hotline on (02) 9805 2000.

Listening to D'music



Portable MP3 players have arrived on the scene, and they really give the 'physical media' personal music systems a run for their money. The D'music MP3 player from Pine is one of the latest personal players to appear in Australia, and it's the smallest and lightest we've seen. It's also packed with features such as audio recording, so we just had to take a look at it...

BY GRAHAM CATTLEY

HERE'S A STARTLING STATISTIC FOR YOU: over the last 12 months, roughly 846 million new CDs were sold worldwide. But at least 17 million MP3 files are downloaded each day off the Internet... That's over 6.2 billion songs a year, which gives you a good idea of what the recording industry has to face in coming years.

MP3 files are so popular mainly because they give you CD-quality sound at about a tenth the size of other formats, and with the rise of fast processors to create them and the Internet to distribute them, MP3s are perhaps the perfect way to store your music. It's possible to record a song from CD and email it to a friend in less than 15 minutes — good news for you and your friend, per-

haps, but not so much fun for artists waiting for their royalty cheques to come in...

When MP3s first came out, the only way to play them was on your PC - but with the relentless pace of miniaturisation it wasn't long before personal MP3 players appeared on the scene.

Back in April this year, I reviewed the Diamond Rio, the first personal MP3 player to hit the market. Revolutionary as it was, it did have a few rough edges: it was bulky, it went through batteries at a rate of knots, and it didn't display the song's title - only its track number. The Rio was a remarkable device, especially as it was the first of its kind, but it didn't quite make the grade from the consumer point of view.

D'music

The D'music addresses a lot of these problems, and adds a couple of rather interesting features to boot. First up, it is small and light (87g, with its two AAA batteries), and it fits neatly in your pocket.

Its 32MB of internal RAM gives over half an hour playback, and you can install another 32MB to bring you up to over 60 minutes total playing time. That's nearly a CD's worth, and for something that fits in your shirt pocket, that's not bad.

The player's main display is a two-line x 12 character LCD that displays the track number and playing time, and (hooray!) the track's title. Now at last you can see the name of the

piece you are listening to, instead of having to remember the name of track 12.

The other main feature of the player is that it has a built-in microphone, which allows you to record over two hours of digital compressed audio. Audio recordings aren't converted into MP3 format; rather they are stored as VOC files within the player. You can record as many of these audio recordings as you like (up to the limit of the internal RAM), and you can then play them back either through the player, or upload them to your PC.

I'd like to emphasise that word; upload. Files recorded can be transferred out of the D'music player into your PC, but it's not just the VOC files that can be uploaded; any MP3 file stored in the player can be uploaded to your (or anyone else's) computer. The implications of this small point are quite significant - with previous MP3 players (like the Rio) you could only download a file into the device, preventing the possibility of further copyright infringements.

As it turns out. The D'music can download, store and upload files of any format - text files, EXEs and so on. Quite why you would want to use the player to transport your files rather than a floppy or Zip disk, I'm not sure, but it is an interesting function none the less. I suppose you do have 32MB to play with, however you are going to need the appropriate software and cabling on the other computer to get your files back off again.

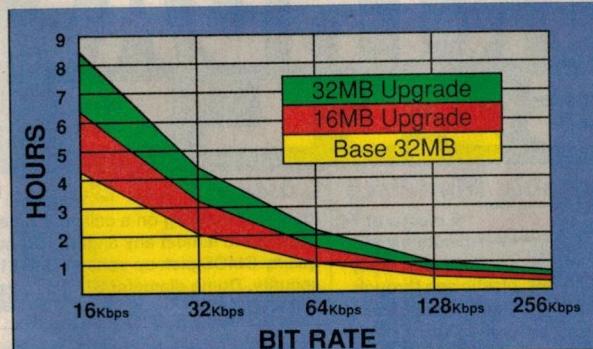
Speaking of software and cabling the D'music comes with everything you need in this department; a CD with the D'music Manager, to handle the file transfers and manage files within the player, and a 1 metre cable that connects the player to your PC's parallel port. You also get a number of MP3 files from a variety of artists, just to get you going.

Ripping stuff

Along with the D'music Manager, you also get a copy of Xing, and Music Match Jukebox v4. Both of these applications will play MP3 files on your PC, but are aimed more at 'ripping' files from CD, and converting them to MP3s.

This is a fairly lengthy process, depending on the speed and resources of your system, but once converted, the tracks from the CD can then be downloaded into the player. This too is a lengthy process as it turns out, as the data transfer rate into the player is around 24K a second. This translates to around three minutes to download a five-minute song, and is around a quarter of the 100K/sec the Rio could handle.

Once in the D'music player, you can play



This graph is just a colourful way of saying that if you double the RAM, you double the playing time. It shows the sort of playback time you can expect on the D'music player, both on its own, and with various Flash memory card upgrades. Note that 99% of MP3 files you'll find on the Net will be recorded at the standard 128Kbps sample rate.

the song back through one of five equaliser settings: Flat, Pop, Classic, Jazz, and Extra Bass. You have the usual options of repeating one track over and over, random track selection, or cycling through all tracks, as well as the ability to loop repeatedly through a selected section of any one track. A built-in menu system lets you delete selected songs, and view memory usage, firmware version, serial number, etc. There's also a handy lock switch that freezes all of the player's control buttons, to prevent any accidents while travelling.

D'vertict

In the two weeks I've had to review the D'music player, I've received a number of comments from others who felt that you can't beat the Walkman-style personal tape players. Frankly, I disagree. Sure it takes a while to download a new batch of songs into the player, but when you look at such factors as size, sound quality and true random access to your tracks, the D'music MP3 player wins hands down. And with the ability to record for over two hours, you may well buy it for this feature alone.

I'm impressed with its small size, clear display, and comparatively low battery consumption, and equally impressed with the voice recording capability — something that sets the D'music apart from other MP3 players.

The D'music suits me very well; I spend around 45 minutes on two separate buses in order to get to work each morning, and portable CD players are hugely impractical in this situation. Tapes are the usual alternative, but the players are bulky and mechanical, and shuffling tapes while on the move really isn't on. The D'music slips into your shirt pocket and gives you 60 minutes of near CD-quality sound and is, in my mind, the solution to the problem. I'll be looking at buying one of these players for myself, and I would strongly recommend that you do the same. ♦

Specifications

Size:	63 x 85 x 17.5mm
Weight:	87g, including 2 x AAA batteries
Power:	150uA standby (off) 95mA playing 70mA recording
Memory:	32MB, expandable to 64MB with extra Flash card.
Playback time:	30-60 minutes, depending on memory size and sample rate of stored files.
Voice recording time:	2 hours, 15 minutes

Web links

- [www.mp3.com]
- [www.eatsleepmusic.com]
- [www.iuma.com]
- [www.listen.com]
- [mp3.lycos.com]
- [www.dailymp3.com]
- [www.mp3now.com]
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- [www.mp3spy.com]
- [www.rioport.com]
- [www.audiofind.com]
- [searchmp3.com]

D'music SM-320V

MP3 Player with voice recorder

Good points: Small, light and compact. Can handle over two hours of voice recording too.

Bad points: An aluminium case would have been better than the light plastic one it has.

RRP: \$369. Additional 32MB Flash memory cards are available for \$225 each.

Available: The D'music player is distributed by Jamsam Pty. Ltd., and is available from David Reid Electronics, 127 York St., Sydney 2000. Phone: (02) 9267 1385; Fax: (02) 9261 8905.

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only \$299

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Measuring 2.6 metres long by 574cm high. Santa is seen riding his sleigh pulled by two trusty reindeer. Attractively coloured scene. Power consumption 574W 240VAC. 8 metre power cord. Sturdy metal frame with mounting lugs. Cat. SL-2904



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CHRISTMAS TREE WITH DECORATIONS

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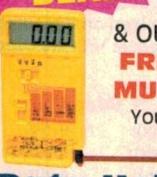
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Cat Price \$299

B'day \$249

See Cat page

69 for details

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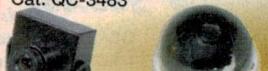
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MOFFAT'S MADHOUSE

A Y2K dry run



It's getting pretty close now. In a few short weeks, fire will fall from the sky, the earth will split open and swallow up all humanity, and worst of all, the world's computers will all stop working, thumbing their noses and going nyah nyah nyah at those who dare touch their keyboards. You know the drill: Y2K.

Well, there's some interesting if not totally unexpected news from this side of the world: Y2K has gone all quiet. A few months ago, the airwaves were peppered with radio doomsayers, urging all who would listen to head for the hills NOW and stock up on storable food, medicine, water purifiers, electric power generators, gold to replace soon-to-be-worthless paper money, and weapons with which to defend themselves from the unprotected hordes who would try to invade their sanctuaries.

Of course it was necessary to forward large sums of money to the advertisers in order to achieve this kind of protection. Those who failed to do so were doomed to eternal suffering, death, or even a life without computers.

At its height, around March I'd guess, the Y2K scares were coming mostly from radio stations with ties to fundamentalist Christian groups. Perhaps this is because Y2K is really the Millennium, which many religions have long associated with the end of the world. Although the concept we know as Y2K is new, concerns about the Millennium go back hundreds or thousands of years.

It's interesting to note that there has been very little Y2K scare material on television. Perhaps this is because of the relatively high cost of television advertising, or maybe television news and current affairs were more obsessed with the sexual exploits of William Jefferson Clinton. However there have been some excellent documentaries lately about the religious connotations of the Millennium. If these should turn up in Oz, probably on ABC or SBS, they'd make very informative viewing.

The biggest push behind American Y2K hype has come from a fellow named Gary North. Many radio commercials rattled off a list of his dire predictions, followed by the toll-free number where you could order the books/ tapes/ gold/ stored food or whatever. Now most of this has faded away, and Gary North is sad.

There is an interesting late-night talk radio program here called Coast to Coast AM, run by a guy named Art Bell. The program may soon be aired in Australia if it isn't already; they've been making noises about it. The program began as a forum for people who have seen UFOs and other weird stuff, but now it's evolved into discussion of anything that's not considered main-stream. Last week they got into a detailed study of the physical concepts of time, and it took some heavy-duty thinking to follow along. Lately they've been discussing links between spiritualism and science. Good brain calisthenics.

Gary North was the featured guest on Coast to Coast a few weeks ago. He was once again warning that the end of the world is nigh, but he was concerned that nobody was listening to him any more. The media, in particular, were irresponsible, since they were slacking off on the gloom and doom.

And then, a curious exchange between host and guest:

Art Bell: "You know, Gary, we started all this. You and I."

Gary North: "I know..." .

'All this', as I remember, began as an advertising campaign for various Gary North products, and a book by Ed Yourdon called "Time Bomb 2000". As for Ed Yourdon, he seems to have gone very quiet, although his web site is still alive and well. But - the question has to be asked: Did this whole Y2K thing begin as a simple radio commercial? Millions of people listen to Coast to Coast AM...

Throughout the year, we've heard various warm and fuzzy reassurances about Y2K. The FAA has tested its air traffic control system and found it to be Y2K compliant. The government's Social Security computers have been tested and found to be Y2K compliant. The banking industry's computers... and so it goes. Lots of people making lots of money testing computers.

GPS problems

All remained quiet on the Y2K front, but then, in mid-August, a bombshell: Airplanes will collide and fall out of the sky. Ships will become lost at sea and run aground. Even bushwalkers

will lose their way and certainly freeze to death. A re-birth of Y2K? No - this time it's GPS.

GPS - Global Positioning System - my new toy. As this is being written I also have another big feature project under way for EA about Electric Bushwalking with GPS. There's going to be lots of good techie stuff in that article, as well as practicalities, so we won't go into too much detail here.

Basically, GPS depends on a group of satellites, and a GPS receiver must be able to find those satellites in order to receive data and positions from them. Each satellite's location is defined in a computer file called an 'almanac'. There is an almanac entry for each satellite in the system (up to 32 of them) and every satellite carries the complete almanac for all its brothers. So the GPS receiver only has to stumble on one satellite, download the almanac from it, and then it can find all the rest.

The almanac is a human-readable text file, in a format called "Yuma". A sample entry for satellite number 2 is shown below. Note the mention of a week number (1 in this case) in both the top and the bottom line. This was a cause for worry, which became a world disaster when hyped up by the media.

A GPS receiver doesn't download a new almanac every time it is used; instead it uses the same one for several weeks, assuming the orbital parameters aren't going to change all that much from week to week. That's why the week number is important. As was the practice back in the late seventies when GPS was born, the software was written to use the minimum amount of memory. So only ten bits were allocated to store the week number.

Weeks started counting at zero, but nearly 20 years later, the count reached 1023 weeks, the limit of the week counter. Then it would 'roll over' to zero again. The concern was that a GPS receiver would suddenly see week zero and not realize that it was indeed newer than week 1023, so the receiver would drop its bundle. GPS manufacturers were aware of this problem, and most receivers less than five years old had provisions in their firmware to cope with it (sound familiar, like Y2K and computers?). Others could be upgraded by loading new firmware

**** Week 1 almanac for PRN-02 *****

ID:	002
Health:	000
Eccentricity:	1.937532425e-02
Time of Applicability(s):	1.474560000e+05
Orbital Inclination(rad):	9.351015091e-01
Rate of Right Ascen(r/s):	-8.251772599e-09
SQRT(A) (m ^{1/2}):	5.153604004e+03
Right Ascen at TOA(rad):	-1.723109841e+00
Argument of Perigee(rad):	-2.175674915e+00
Mean Anom(rad):	2.858549118e+00
Af0(s):	-1.049041748e-04
Af1(s/s):	-3.637978807e-12
week:	1

into their flash memory,

On rollover night, the world collectively held its breath (or so the media would have you believe) and then... planes kept flying, ships kept sailing, news producers wiped egg from their faces. Nothing happened — well almost. A few very elderly GPS receivers did play up in various ways, but none of these were steering aircraft or ships to a watery grave.

Most GPS manufacturers claimed that there would be absolutely no effect on current model equipment from the week-counter rollover. But, from what I have read in internet newsgroups, this wasn't entirely accurate either. My own GPS receiver was designed in 1998, so it's fairly new. It is an excellent instrument, and it never ceases to amaze me how it can instantly plot a position within a few metres.

The morning after the rollover, I strolled out into my front yard, fired up my GPS, and let it acquire whatever satellites were flying around at the moment. After a few calculations, it figured out that I was at home. And that was that.

But later, taking the GPS on bushwalks and bicycle rides, it didn't seem to plot my course as accurately as before. Mind you, this was very minor, and I was really nitpicking. My plane wouldn't have missed its airport, or my ship run aground, but I just had this nagging feeling the GPS wasn't quite as good as it was before the rollover. Accuracy is related to the number of satellites being used for the position fix, and my GPS didn't seem to be locking onto as many satellites as I would have expected.

Finally I resorted to the standard computer solution for niggling cases such as this: if all else fails, re-boot. I gave the GPS receiver a command to throw out its entire almanac and download a fresh one from one of the satellites. Five minutes later the job was done and the GPS happily grabbed a whole handful of satellites. Accuracy was again as good as ever.

What this adventure shows is, 1) rollover to zero occurred, and there was no disaster, 2)

despite assurances from the manufacturer, the rollover appeared to cause very mild effects in my GPS receiver, and 3) a re-boot fixed it.

Back in Y2K-land, the commercials for stored food and generators now refer to earthquakes and volcanoes, dangers which are much more real in these parts than a Millennium-driven end of the world. Magazines like Newsweek are calling Y2K doomsayers 'childish', and Y2K precautions are much less dramatic: get some money out of the bank over New Years, the same amount you would take out for any long weekend. And that is just simple insurance against other people getting twitchy and draining the ATMs.

Software confuseration

Change of subject: Time to bash Microsoft again. All this GPS stuff has got me interested in mapping software. The star performer in my computer is a program called Terrain Navigator which effortlessly plans my bushwalking trips and later shows me how I managed to get lost. During a trip to a big discount store, I found a package called "Streets and Trips 2000" which allowed you to plan car trips both urban and rural, complete with Melways-style maps and turn-by-turn driving directions.

Streets and Trips cost \$35, but there was a mail-in rebate for \$20, so the actual cost would be a cool \$15. As well, this was a Microsoft product, so it had to be pretty classy. I'd never actually bought a Microsoft product before (they seem to come pre-loaded on your computer) So I decided Streets and Trips might be fun to investigate.

Don't tell the boss this, but it is my habit to try new and untested software in the big Dell computer at the TV station where I work. This machine has simple uses - word processing, program log generation, and graphics work. It also serves as a 'still store' for photos and images used on the station.

Everything in it is backed up on another computer, so if it blows up, I just link them together and restore away.

The Dell runs Windows 95, latest version, with Netscape and Opera as its web browsers. Internet Explorer was not allowed in. Before beginning with Streets and Maps, I carefully backed up the registry in case I wanted to completely eject Streets and Maps and restore the Dell to its former glory.

Just like Terrain Navigator, Streets and Trips came on two CD-ROMs, one containing the main program, and the other containing the maps. So I inserted the program CD and ran 'Setup'. After displaying the usual Microsoft EULA (End User License Agreement) and making me click 'Agree', the CD spun for a while and then came up with another message: before going any further, it wanted to install Internet Explorer version 4.1. There were two choices given here, Agree or Quit. No Explorer, no Streets and Trips.

So I held my breath, gritted my teeth, and clicked Agree. The CD-ROM spun, and the hard disk spun, and files flew hither and yon throughout the computer. Eventually it wanted to re-boot, click OK. Then came more CD and hard disk spinning, more files loading, and another re-boot. Before it was done, the computer booted FOUR TIMES as new software linked its tentacles throughout the very bowels of the operating system.

After all this, Streets and Trips worked fine. Most impressive, in fact. I asked it to tell me how to get from my house to Silverdale, the town where I'd bought the Streets and Trips software. And it came up with a list of go here, turn there, all ready for printing. It's a trip I have made many times and the Streets and Trips route totally agreed with mine.

As another test, I asked the program to work out a route to reproduce the last big road trip I'd made, from Reno, Nevada to my home in Port Townsend, Washington. This time it swung way down into California and then east to Nevada, what seemed totally out of the way. But this was what it considered the 'fastest' route. When I asked for the 'shortest' route it came up with back roads that I thought only people with local knowledge knew about. Pretty damn clever if you ask me.

But WHY does Streets and Trips have to load in Internet Explorer and heaps of other software and files, just to show maps and work out routes? Terrain Navigator does much the same thing, but it loads quietly and minds its own business once it gets there, without trying to take over the whole computer. I guess Microsoft thinks no computer is complete without Internet Explorer...♦

OPEN Fist

BY STEWART FIST



The disappearance of research funding

It appears likely that the oldest, and most productive laboratory conducting research into the biomedical aspects of radio exposures will close down in the near future for lack of funding. This is the Bioelectromagnetic Research Laboratory at the University of Washington in Seattle. It became famous for conducting the original US Air Force research into the consequences of radar exposures back in 1978. In the process they devised the first systematic experimental procedure and equipment to control dosage of exposure in large numbers of laboratory rats.

Dr Bill Guy conducted this \$5 million confidential research project (in real dollars, the most expensive ever mounted), and many years later he revealed that "primary tumours developed in 18 of the exposed animals but in only five of the controls." This was a highly significant difference — although the Air Force and Guy himself, later tried to play down the possibilities that there might be a causal link.

Since then, the laboratory has been taken over and run by Dr Henry Lai and Dr Narendra Singh. Dr Lai is the cellular biologist with the interest in EMF exposure problems, while Dr Singh is the foremost authority in the world on 'comet assay' techniques and an expert on aging. These investigatory tools are closely related to the DNA fingerprint 'electrophoresis' techniques used in crime and paternity work. Comet assays allow the scientists to look at the pattern of damage to the DNA in individual cells under a special UV microscope; something not possible until a few years ago.

Singh's comet assay techniques are now widely used all around the world to check whether genetic damage has been caused to human or animal cells by exposures to low-level toxins (pesticides, etc.), to radiation (ionising and non-ionising) or to aging processes. I've met both Henry Lai and Narendra Singh and visited them in Seattle, and it would be disastrous if the work of this research laboratory was discontinued after so many years. One of the key advantages that such long-term programs provide is the ability to compare new results with past findings in an experimental environment that has remained relatively consistent over the years.

Cell function

Lai and Singh, and most scientists involved in EMF research, are not just interested in possible cellphone/health issues. They see the potential for gaining an understanding of the basic mechanisms by which normal and abnormal cells function at the molecular level. At these single-cell structural levels they are dealing with cells which are a tiny bio-electrical device about as complex as an Intel Pentium chip, possibly with little-understood quantum-level interactions.

If this laboratory closes, the USA will lose its last independent,

highly specialised, bio-electromagnetic facility. Elsewhere, American scientific research (and the public release of information) in this area is now controlled and manipulated by the mobile phone industry through private laboratories which will sign confidential contracts. The industry has taken over the role of funding from government, and now play favourites with cooperative scientists.

World-wide, the cellphone industry also has a program of denigrating scientists who are seen as 'opposition', and of dismissing any adverse research findings. They've been particularly vicious in attacking Lai and Singh since they reported a doubling of single-strand DNA breaks in rat-brain cells, after just two hours of cellphone-level exposure.

Remember, this is an industry which now earns more revenues worldwide than the tobacco business, and it is an industry which has learned lessons from the way the cigarette manufacturers were taken to task, and how they conducted their defence. The cellphone industry is unlikely to make the same mistakes and be caught out in deliberate scientific distortions — but they can control the direction of research through funding, which produces much the same results.

Drs Lai and Singh, together with Dr Ross Adey at Riverside University in California are among the few independent researchers left in the USA with the skills and experience to actually conduct meaningful research. This is a scientific discipline where the necessary range of knowledge can't be picked up overnight; it requires a multi-disciplinary approach and many years of experience because they are dealing with low-potential, high-risk, long-term, subtle effects.

The industry has taken over the role of funding from government, and now play favourites with cooperative scientists

In the past few years we've seen Professor Stephen Cleary of Virginia Commonwealth University retire from research due to lack of funding. Dr Cleary sits on the World Health Organisation's review panel for RF research and he is famous for having found that human glioma (brain) cells demonstrated an altered rate of DNA synthesis after a single exposure to microwave radiation, way back in 1989. He also found that such damage was probably cumulative.

Not worthy

However Professor Cleary has not been considered worthy of funding by the industry's Wireless Technology Research organisation or by Motorola, the main independent company giving grants to scientists. Professor Ross Adey, who has 35 years of experience in researching

EMF and cell mechanism as the Distinguished Professor of Physiology at Los Angeles' Loma Linda University School of Medicine, has published hundreds of papers on the electrical nature of biological cell mechanism. Like Dr Cleary, in the last year he is being forced into early retirement through lack of grants from government or industry.

Dr Adey made himself unpopular with Washington bureaucrats when he chaired the US National Council for Radiation Protection and Measurement's (NCRP) committee. A few years ago this committee, then funded by the Environmental Protection Agency (EPA), was given the task of evaluating the standards for powerline frequency electromagnetic fields. After many years reviewing the literature and conducting interviews with scientists, the committee reported that the permitted exposure standard in the USA were far too high, and that real risks existed in the community. The committee's draft report was subsequently ignored by the management of the NCRP — and been kept as 'A working paper under review' for the last four years.

Adey's work in both mains-power and RF has been systematically attacked because he has the courage of his convictions and openly states his opinion that existing exposure standards are much too high, and not based on good science. Such 'advocacy' was not acceptable to Motorola which withdrew his funding with the result that the laboratory at Loma Linda collapsed.

Dr Jerry Phillips who worked with Ross Adey, also found his independent funding withdrawn after he published a paper revealing DNA damage in primary lymph cells exposed to cellphone radiation — a finding which strongly backs up the Lai-Singh research. Jerry Phillips has now largely withdrawn from research, and earns his living as a university lecturer and biomedical consultant.

Many other independent scientists with long-experience in this field have similar stories. They've all been forced to change direction in recent years due to a lack of independent funding either because they refuse to work under the conditions imposed on them by the WTR or Motorola, or are not offered funding because of past adverse findings.

Especially disheartening, is that these experienced scientists see industry funding going to scientists with no experience and no background in non-ionising research — and often, those with very little specific biomedical knowledge. There is still money on offer in the RF field provided scientists are willing to toe the industry line.

But the industry assumption of funding (by both the WTR and Motorola) has meant a balancing drop in government funding, and therefore a disappearance of independent research. Congress has assumed that, with the cellphone industry funding the research, government involvement is no longer necessary. This means that the US government's own research facilities are equally hamstrung.

At the EPA's Health Effects Laboratory (supporting the government regulator on exposure matters) the funds-drought has reached ridiculous proportions. As a result, Dr Carl Blackman (also on the WHO Review panel) is about to retire.

Dr Blackman has published many important papers, but he's also been cut out of the funding loop. He made a number of discoveries which revealed the so-called 'window' effect (different radio frequencies create different biomedical outcomes), and the role of calcium ions in cellular functions.

Similarly, at the Federal Drug Administration's Center for Devices and Radiological Health, Dr Ewa Czerska found that RF radiation could enhance the proliferation of human brain tumour cells. This was a part-replication of Professor Cleary's work, but Czerska's work remains unpublished, and she has since lost her research post and now holds down a desk job.

So it is ironic that, as criticism of the Lai-Singh DNA-break research has slowly died and further research findings support their findings, the likelihood of anyone continuing and extending such independent research disappears.

Simultaneously the industry's PR efforts to dismiss adverse-health claims as crisis mongering, takes on all the appearances of the worst years of the tobacco industry under threat: "Nicotine is not addictive ... and there is no evidence that cellphones can damage your health." ♦



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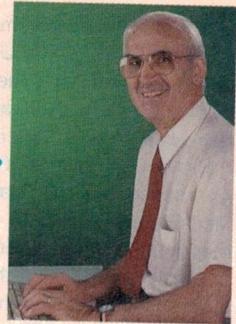
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Forum

Your software may be cruising the Net, even if you aren't!

Conducted by Jim Rowe



Tom Moffat's column in the July issue about the way software firms and others can 'snoop' on you via the Internet has produced a couple of interesting responses, from readers with rather different attitudes. I'm presenting them both for your interest — along with some more comments about the infamous region coding of DVDs.

YOU MAY RECALL that Tom gave his July column the title 'Go Away and Leave Me Alone!'. He began by discussing the Melissa email virus and how its nefarious author was tracked down, using the Global Unique Identification (GUID) effectively built into every Windows computer by Microsoft. This led to a look at Internet security, and the way various software firms and their products can 'take liberties' with your computer system, supplying and retrieving information without your approval or even knowledge...

Tom found it all pretty unsettling, and believed that readers would too, when they knew more about what was going on. So it's perhaps not surprising that the column has attracted some comment — although broadly speaking, readers seem to have split fairly evenly into two camps with almost diametrically opposing views. One group seems to be taking the view 'don't worry about it, just lie back and enjoy it', while the other is just as concerned as Tom and keen to see this sort of activity curtailed.

As an example of the first approach, although not entirely so, here's an email which turned up from occasional contributor Benjamin Low — who is a pretty hotshot computer programmer at Wollongong Uni, if I recall. To be fair Mr Low isn't exactly taking the gung-ho approach, as you'll see, but he does seem less concerned than Tom:

Having just read July's EA, including Moffat's Madhouse, I wonder if Tom sleeps at night. All that FUD (fear, uncertainty and doubt) surely keeps him tearing apart his operating system, looking for more 'evil' data :). Let's hope that EA's readers realise Tom's ramblings are not much more than unsubstantiated musings.

It seems Tom is concerned with the 'insidious' GUID. Is he also afraid of his credit card number? His car's VIN? His microwave's serial number? These are all numbers which can be associated with Tom Moffat — via the bank account, the car registration, or the manufacturer's warranty registration.

A GUID or similar is no different to any other serial number — and there are probably more 'serial numbers' in a modern day computer than most people realise: network card hardware (MAC) addresses, hard disk version and serial numbers, BIOS finger-prints, IP network addresses, and of course software registration numbers. These numbers are, for most practical purposes, random noise. They contain no information useful to the dreaded marketeers, unless the user decides (consciously or not) to associate themselves with this random number — perhaps through registering their software. But not through simply browsing a web site (web browser security breaches aside).

Tom's assertion that web sites can interrogate and/or modify the Windows registry is in the large untrue. If he is really worried about security breaches, he should stick to a non-Java, non-ActiveX web browser and sleep peacefully.

'Internet-big-brother' programming is technically simple, though few if any major software players are incorporating such features in their products — the PR would be hell :(. The scary thing is that it is not trivial to spot such activity; you have to look for it.

Certainly the large majority of today's internet users cannot tell what's going on under the bonnet. But those that do, do a very good job of 'policing' — see the bugtraq list ([via www.securityfocus.com/](http://www.securityfocus.com/)), comp.society.privacy and comp.risks newsgroups, and the Privacy Forum (www.vortex.com/privacy.html) for starters. Rather than Tom's ramblings, these sites provide far more developed reasons why we should be scared.

Thanks for those comments, Benjamin. Perhaps you're right that serial numbers in themselves aren't a worry, although I'm not sure exactly what you mean by the bit about '...unless the user decides (consciously or not) to associate themselves with this random number'. Do you mean that registering their hardware and/or software does provide this association, and that therefore the only way to avoid getting on a marketing database is to refuse to

register the products they buy, like Tom? Frankly this seems a rather drastic solution, because in refusing to register people often also deny themselves the warranty protection they're entitled to as a legitimate buyer.

I don't know about Tom, but I'm also not really happy about your suggestion that the only way to be really protected against net security breaches is to stick to a non-Java, non-ActiveX browser. After all, nowadays so many web sites seem to assume blithely that we are all using one of the latest browsers with these features. In fact on a lot of e-commerce sites in particular, you really can't get much further than a half-baked look at their home page, unless your browser CAN run the Java and ActiveX 'bells and whistles'. Turning them off, or using an older browser without them, seems to be rapidly becoming regarded as the web equivalent of joining the Amish and opting out of the modern world...

(It's a far cry from the old retailing motto that 'the customer is always right', isn't it? The new policy is more like 'if you haven't got the latest browser, get lost!')

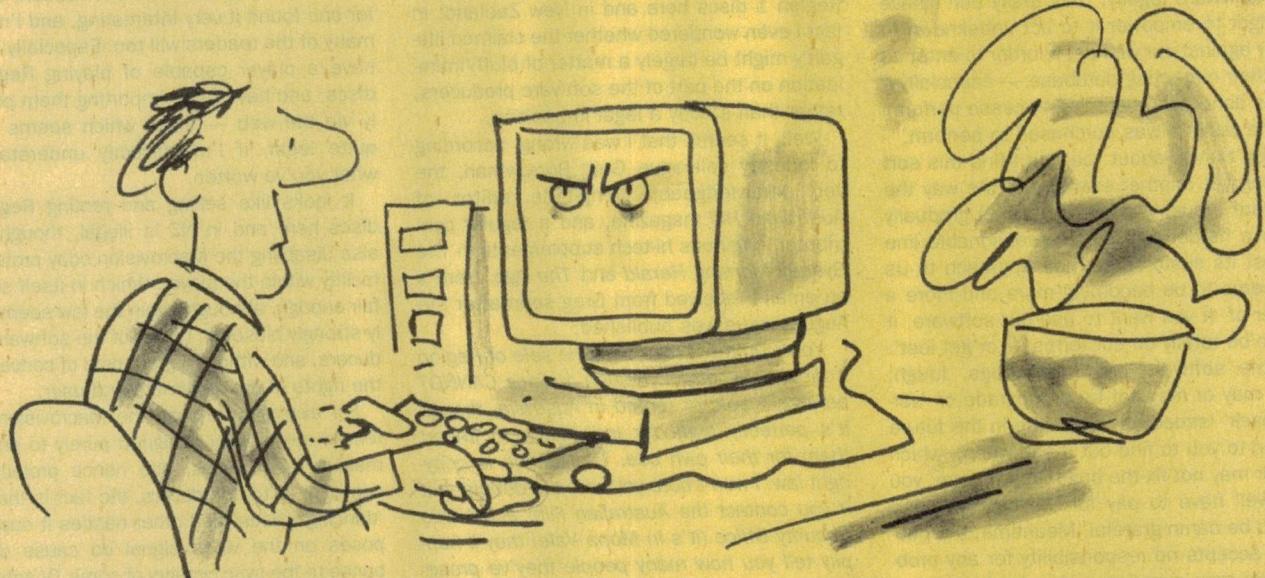
Hopefully, Mr Low, you weren't suggesting that Tom was an old fuddy-duddy who should opt out of the net/web, merely because he was concerned about firms snooping inside his computer, while he's online?

I do note your reference to other aspects of net security which you believe are more worrying, though. Thanks for those URLs and newsgroup references, too. I'm sure quite a few readers will follow them up.

Differing view...

The other email I'm going to show you is from someone who's fairly definitely in the other camp, when it comes to the matters Tom raised in his column. In this case the reader concerned is Tony King VK3FBD, who actually sent his response directly to Tom himself. It was Tom who thought we should run it here in Forum — not just because it was supporting what he said, but because he felt it was so interesting and clearly written.

mon



So here's what Mr King wrote:

Your column in the July 1999 EA struck a note of sympathy, due to the fact that I have been suffering many of the problems with intrusive marketing via the internet.

A recent example in my case was with OmniPage Pro, a program I have used for many years (as the legal owner), even though like yourself I don't register software. In my case this was due to an unfortunate experience early on in the days of computing, when my personal details were sold to a third party by a so-called reputable company.

After years of use with OmniPage (dongled variety) and generally being very happy with its performance, I was well aware of its minor shortcomings and when I recently spotted an ad in a magazine for an update, I needed no pushing to purchase the update.

Well, when I loaded the software it decided to scan my system and help itself to my modem to register. Now this might be fine for Mr and Mrs Jo Citizen — but my modem WASN'T a modem, but a Hayes compatible homebrew household control system. If I hadn't spotted what it was up to and stopped the software in time, the end result could have been quite nasty and costly, in terms of what damage uncontrolled bit streams to the 'modem' could have caused.

As if this wasn't enough, after I stopped the modem transfer the software then attempted to grab my internet connection to register itself.

Now this was about as intrusive as you can get, but this nasty little piece of programming

had yet another surprise. Seeing that I had stopped it registering itself, the software now informed me that unless I registered it within 25 uses, it would stop operating. Pretty nasty, for a product which I had legally purchased!

Of course now the fun started. I copied down the registration number and a key code which the software displayed, and faxed them to the supplier along with a statement that I required the numbers to make the software operate and that any personal details were supplied only to enable the return of the registration number and were NOT to be used for registration.

How naive could I get. First of all the dealer faxed back an incorrect registration number for the software and a tirade which summing it up, simply said software piracy is naughty and this will stop it. Also of course it said a company with integrity like theirs would NEVER release information.

To use an old Australianism, Ha Bloody Ha. When I rang up the dealer to sort out the correct registration number, the girl who answered the phone (in response to my complaint about the wrong registration number) asked my name, and then without any prompting accessed their registration database, read back all of my personal address, phone and fax numbers to me without any idea or proof of who I really was. So much for integrity and my written request that they do not put information on their database.

Finally the really nasty sting in the 'marketing' tail of this software is that if my system crashes, which because I use Windows is not

unheard of — and in my case because I use the computer for software development, whilst not exactly an everyday occurrence it's certainly not a remote happening — means that should I have to reload this software I have to go through the full registration process again 'every time'.

As you indicated in your article, marketing has gained control of the software industry and rides roughshod over all moral and decent behaviour. I wait now for the endless 'offers' to arrive in my mailbox, for services I don't need or want.

Needless to say this is the last time I purchase software from this company. I certainly have very little faith in their remarks about integrity and I strongly resent the really invasive way this software attempted to use my system for its own ends.

Hmmm — thanks for your comments too, Mr King. That was certainly a good example of application software taking unwarranted liberties with your system, wasn't it? Just as well you spotted what it was trying to do with your 'modem', too. I'll bet the Caere Corporation, publishers of OmniPage, wouldn't be keen to compensate you for any damage done by the program when it tried to register itself, either.

As you say, the marketing sharpies (and the bean counters, I'd suggest) do seem to have taken over in the software industry, to the detriment of customer relations. Having software that just 'takes over' your machine and decides to call up the publisher to register itself — without so much as a 'do you mind' — really is pretty rich. Even worse is the threat of refusing to continue working, if

Forum...

you won't let it register you, and regardless of whether you've purchased it legally or not.

Surely most of us don't mind the publisher of good software taking reasonable precautions to prevent piracy. But once we've done the right thing and purchased the right to use their software legally, they really don't have the right to empower it to act unbeknown to us, or against our wishes, in order to enter us into their marketing database — especially if this is done by threatening to cease performing the tasks it was purchased to perform.

I don't know about you, but I find this sort of thing yet another example of the way the software industry in particular has gradually taken a harder and more unreasonable line against its customers. Their approach to us all seems to be becoming more and more a matter of 'if you want to use our software, it has to be totally on our terms — or get lost'.

If the software has nasty bugs, tough; there may or may not be an upgrade or 'service pack' issued at some time in the future (it's up to you to find out if and when), which may or may not fix the bugs. In any case, you may well have to pay for the upgrade, and should be damn grateful. Meantime, the publisher accepts no responsibility for any problem you may experience due to the bug — that's your problem too.

Don't want to install it the way the publisher wants? Don't want to let it register you the way the publisher wants? Tough. Either accept the terms, or don't buy the software.

It's all a bit one sided, isn't it? Heads the publisher wins, tails you lose. I can't help wondering how this approach manages to comply with trade practices and consumer protection legislation, either. Perhaps Bill Gates and his cronies are so wealthy and powerful that the relevant authorities aren't game to investigate.

Of course sooner or later, this sort of cavalier attitude to the customers inevitably results in a market backlash. Even decent, law abiding customers like Tony King, once they've been bitten by 'take it or leave it, we make the rules' products like software that tries to run roughshod over them and their computer, will eventually react as he's done — by deciding to never buy another product from that publisher.

Presumably some of the larger publishers feel they're large enough now not to worry about alienating customers in this way. (The 'plenty more where they came from' philosophy...) But frankly I believe they're wrong. History shows that even big companies can fall flat on their face, once they cease caring about the legitimate rights, needs and aspirations of their customers. And they deserve to, surely.

Region 1 DVDs

To end up this month, let's return briefly to the thorny subject of DVD region coding, modifying Australian and New Zealand (Region 2) players so they're capable of playing US (Region 1) discs to get access to a much larger range of

titles, and the associated question of whether Region 1 discs can be legally sold here — or even imported privately from the USA. Clearly all of this does go on in practice, but people are concerned about the legalities...

You may recall that when we last tackled this subject, in the August column, I wrote that I wasn't sure about the exact legal position regarding the sale, rental and use of Region 1 discs here and in New Zealand. In fact I even wondered whether the claimed illegality might be largely a matter of bluff/intimidation on the part of the software producers, rather than strictly a legal imposition.

Well, it seems that I was wrong, according to industry colleague Greg Borrowman, the very knowledgeable long-time editor of *Australian HiFi* magazine, and a regular contributor to various hi-tech supplements in *The Sydney Morning Herald* and *The Age*. Here's an email I received from Greg soon after the August issue was published:

Your comment regarding the sale of Region 1 discs is incorrect. Region 1 discs CANNOT be legally sold or rented in Australia, though it's perfectly legal for individuals to import them for their own use. The reason is copyright law. I won't bore you with the details, but if you contact the Australian Film and Video Security Office (it's in Mona Vale) they'll happily tell you how many people they've prosecuted (and are in the process of prosecuting) for selling Region 1 (and other Region) DVDs.

The changes in the law regarding parallel imports and books DO NOT apply to films, videos and CDs. Another problem is that the Region 1 discs being sold have not been passed by the Australian censor, and are also therefore not able to be sold (even if the film has already been passed by the censor in another form — video, LD et al). I'm not certain about the law in NZ, but I think your reader John Penny will find his local Blenheim store is breaking the law also, and liable for quite large penalties!

There was another point one of your readers (Laurie Fava) brought up, to the extent that it was 'not illegal to modify your own (DVD) player'. At present, it isn't actually illegal for anyone to modify a DVD player for multi-region use. The only thing preventing distributors from doing it themselves is that their head offices have signed a licensing agreement, a condition of which is that they will neither modify DVD players for multi-region operation nor sell any DVD player in a Region that is not specific to that region. (i.e., you can't sell anything other than Region 4 players in Australia).

HOWEVER, as I understand it, the changes in the Copyright Act (Electronic Protections) that has been passed (or is about to be passed, I'm not sure) make it illegal for ANY PERSON to interfere with a legitimate scheme intended to preserve copyright. It has been argued that this might not apply with Region Coding, which is an artificial scheme that does not actually infringe copyright, but it appears that what happens in practice is that when you disable a Region Code chip, an

unintended side-effect is that the Macrovision anti-copying protection circuitry that prevents you from copying a DVD is also disabled.

You'd better check with the Arts and Law Society about the status of the Copyright Act. It could also provide the exact wording of the particular part of the act.

I hope this helps.

Thanks indeed for that information, Greg. I for one found it very interesting, and I'm sure many of the readers will too. Especially if they have a player capable of playing Region 1 discs, and have been importing them privately via the web — all of which seems to be quite legal, if I'm correctly understanding what you've written.

It looks like selling and renting Region 1 discs here and in NZ is illegal, though, and also disabling the Macrovision copy protection facility within the player. Which in itself seems fair enough, although again the law seems fairly strongly biased in favour of the software producers, and without a great deal of concern for the rights of the legitimate end user.

For example although the Macrovision system is supposedly designed purely to prevent making tape copies, and hence protect the copyright of the producers, the fact is that the 'dancing pulses' and other nasties it superimposes on the video signal do cause disturbance to the sync circuitry of some TV sets and video projectors — causing jitter, 'flag waving', picture bending and so on. In other words, it can clearly detract from the ability of the end user to achieve what they've been encouraged to purchase the DVD for in the first place: watching a really high quality version of the movie concerned, in their own home.

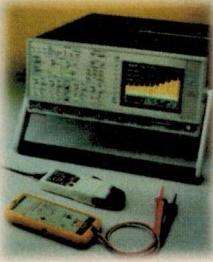
You'd think that such consumers would have a legitimate right to remove the Macrovision nasties from the video by one means or another, in order to allow them to watch a stable and clear picture with their TV or projector. Wouldn't you? I certainly would.

I daresay the software producers would fight tooth and nail to prevent the law from allowing this, because once you allow the Macrovision nasties to be removed for clear viewing (a legitimate consumer right), the signals are also capable of being copied via a VCR — which is clearly illegal. But the point I'm trying to make is that if the law simply prevents anyone from removing the Macrovision signals, it's essentially saying that the rights of the producers to protect their copyright are more important than the rights of consumers to watch a clear picture from a DVD they've purchased.

By the way, this is considering the Macrovision copy protection system quite separately from the region coding system. And the two are really quite separate, of course.

Perhaps consumers are going to have to assert their collective rights more strongly, in many of these situations that are arising from the adoption of new technology. Big business certainly isn't shy about asserting its rights, and I suspect that if consumers don't watch it their rights may easily get downgraded by default. ♦

SERVICEMAN



A VCR of dubious provenance, and the problems caused by meddling customers!

In the three stories we have for you this month, a reader sets me straight in the fine art of tuning a VCR, I encounter a VCR that couldn't be tuned, and a reader recounts his tale of woe, where a helpful customer 'fixed' one problem, only to create a much larger problem instead!

I'll open the column this month with a confession — I am not as clever as I like to think I am.

I thought I was keeping up with technology pretty well. Although I may not have known the fine detail of all the new developments, I reckoned that I had a reasonable grasp of the main points and that I should be able to work with whatever came my way.

Well, I'm not so smart and a recent occurrence proved it. A perfectly conventional looking VCR hid a new trick that leaves me with a red face and the need to explain to my readers just what happened.

If you can remember back to the July edition, you'll recall that I did battle with a Panasonic VCR, a model J1. The machine had a hidden power supply fault that the owner forgot to tell me about, and it was also 'difficult' to tune to the local UHF channels. The power supply fault was fixed after discussions with a colleague who is more familiar with the model than I am. But the tuning problem remained even after I had managed to set the machine up to the customer's requirements.

At the time I wrote the July column, I was not aware that I had missed something. However, reader Colin Leonelli was quick to email us with a correction. Here's what he has to say...

The reason for this email is a response to the Serviceman with regards to the July article about the Panasonic VCR. It seems hard to believe that a tech of his long experience and knowledge has not seen this fault before. I live and work in Ingham, N.Q. and I

see this fault with C3 every day of the week.

Also the tuning problem is not a problem at all. His fatal mistake was to not read the owners manual! The tuning procedure he was using is correct up to a point. While tuning up or down using the - or + buttons, he is only fine tuning, thus taking a long time to tune any stations.

The correct procedure is to tune while holding down the NEXT button and either the + or - button. This puts the tuner into its fast search mode. When a station is found the NEXT button is released and fine tuning is completed using the + or - buttons. I hope this info is of some use to the serviceman or maybe other techs and readers

Well, I've admitted my ignorance and apologise for misleading anyone who was misled! However, I have an excuse and I think my embarrassment is a small price to pay for the important lesson contained in this story. As Mr Leonelli comments, a serviceman of "...long experience and knowledge..." Well, that is true. My experience began after I left school in 1944 although the knowledge gained between then and the start of colour TV in 1975 is now totally useless.

Then again, I am pretty cluey on Philips K9 and Kriesler 59-01 chassis, and I can find my way around an HMV C211 with my eyes closed. But I haven't seen one of these for about five years.

As for VCRs, most of those that found their way to my workshop were old ATV-4s, NV-300s, VC-483s and others of that vintage. Most late model machines go to the manufacturers agent during the warranty period and for a year or two after. Not until they change owners do they finally reach my bench.

That's been my problem all along. As an independent serviceman, I got to work on a vast array of types, models and brands. But I never did get an agency, and hence I never got to see any of the latest gear, except by looking over a mate's shoulder in his workshop.

Finally, the Government thought I was worth pensioning off about four years ago, so in fact, I have had very little opportunity to see much of the very latest gear, that's been released in the past few years. I try to keep up-to-date by reading, attending seminars and talking with still-active colleagues. But with new products and new models

appearing almost monthly, it's impossible to stay abreast of developments unless one is full time in the industry.

So that is why I was not aware of the two-speed tuning feature on the Panasonic J1. There was no indication on the machine that the NEXT button was the principal tuning control. Now I know and I won't forget it. But what a way to learn!

Oh! And by the way, the owner didn't help. He could have brought the User Manual with him. And I don't think he'd read it, either!

I just hope that this will remind working techs, and inform young would-be techs, that servicing these days demands constant and intense study. Not only do today's models change rapidly but they also disappear quickly. The Philips K9 was released in 1975 and I was still seeing an occasional set into the mid 90's. Most of today's sets will be junk within ten years.

I don't know what the answer is, but I do know there is a risk that I'll make another howler in these pages before long. All I can promise is to correct the mistake as soon as possible, and to apologise to readers for my fallibility.

Dodgy VCR

While we are on the subject of VCRs and tuning the same, another, somewhat different problem cropped up the other day. I was asked by a respectable and respected customer if I would call and tune in her new VCR. The young lady told me that the machine had been given to her by an acquaintance who "...had no further need of it!"

It was an AKAI VC-G60S, a fairly recent model and in very good condition. As she had been using a 10-year-old Philips machine, the new acquisition was very welcome.

I duly reported at her apartment and was shown to the video corner. She had a reasonably modern AWA television, and the new Akai on sliding shelf in the 'entertainment unit'. The new machine was not connected up, so my first job was to sort out the various cables and plug them into the appropriate sockets. Then, with the VCR powered up, I set about tuning the TV to the video output.

All of this is quite normal and 'money for jam' to the experienced technician. It was the next part of the procedure that aroused

SERVICEMAN

my suspicions about the recent history of this machine.

I looked for the tuning buttons on the VCR front panel but could find nothing. The machine's controls consisted of nothing more than a power button, two channel selection buttons, and the usual five mechanism buttons for play, record, FF, rewind and stop/eject. It was obvious to me, if not to my customer, that most of the functions for this machine were set using the remote control. There was no provision for setting the clock, timer recording, or channel tuning on the machine itself.

When I asked her for the remote, she had to admit that she didn't have one. Her 'acquaintance' had not given her the control when he handed the machine to her. So, I had to explain that there was nothing I could do to tune in the VCR channels. The ABC channel 2 was OK, but the other local channels were all over the place. The machine had obviously come from some distant area where the channel assignments were quite different.

In the end, I got the machine set up so that she could view pre-recorded tapes but not record anything other than ABC programmes. It wasn't the best arrangement, but it was all I could do in the circumstances.

Then came the inevitable question — "Can I get a replacement remote control?" At this point, I had to dash her hopes... Firstly, why would anyone give away a reasonably late model VCR? Quite obviously, he had got it for nothing — or for near to nothing.

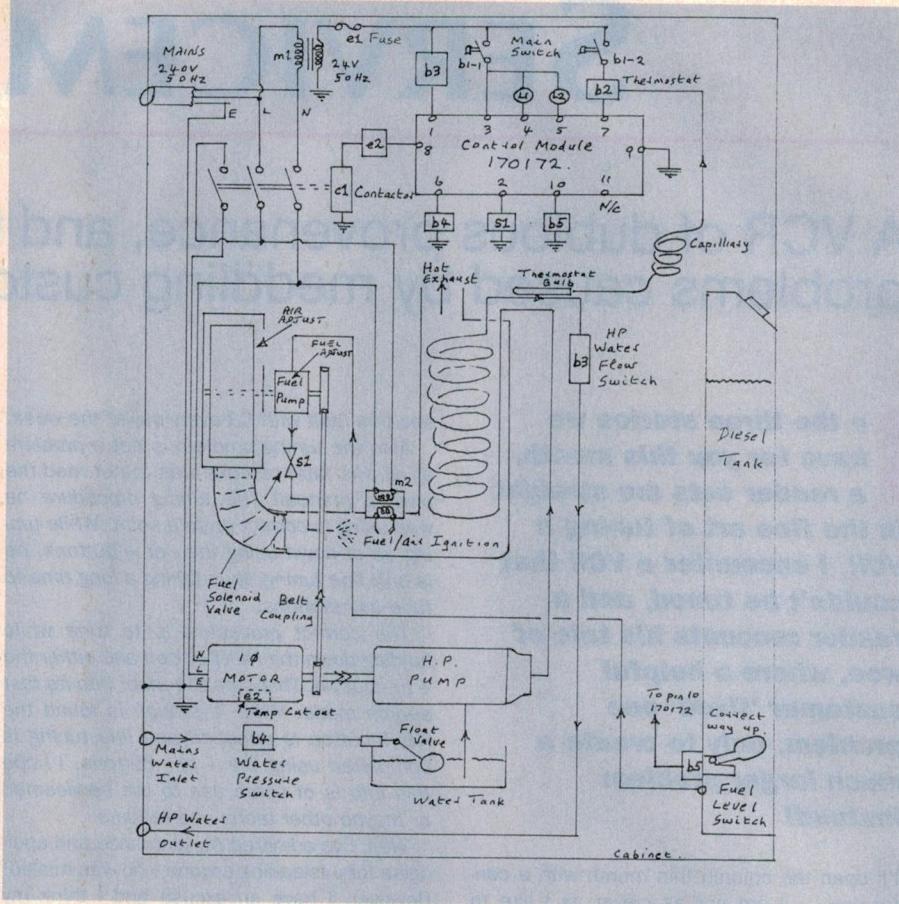
Secondly, why would a machine that required a remote control for all of its common functions be given away without that device? The most likely reason was because it had been stolen and the thief didn't realise that the machine was useless without the remote!

I asked my client about the 'friend' who had given her the VCR and learned that he was a gambler who spent most of Saturday down at the local with his mates. That shouldn't be taken to mean that he was the thief, but he certainly knew the villain better than he new VCRs!

As to the question about a new remote, I had to advise my client against any adventure in that direction. If the machine had been stolen, there was a good chance that its loss had been reported to the police and any attempt to replace a vital part of the system was sure to arouse suspicion.

My procedure would have been to ask for the serial number of the machine, on the pretext that remote controls were often changed during a production run of any particular model. Not strictly true, but true enough under the circumstances.

Then, if there was any hesitation by the customer in providing the serial number, my suspicions would be aroused and I would try to contact the local CID. If I was wrong, I



would likely lose a customer. But if my nasty nature was right, I would be instrumental in nabbing a local villain which must be a plus for the whole community.

In this case, I opted for a middle course. I referred my client to a mutual friend who has a legitimate collection of orphaned remote controls, one of which may well suit the machine in question.

I feel a bit bad about not trying to nail the criminal, but then I may have saved my customer the trauma of official enquiries. After all, the machine MAY have been perfectly legit. I don't know. I just have my suspicions.

(Then again, in view of the email from Colin Leonelli, I wonder if I missed something on the Akai and didn't need the remote control at all!)

Now for a change of pace...

Meddling customers

A few months ago I used a story about lost magnetism in a high pressure car washing machine. It came from Mr D. Gott of Toowoomba, in Queensland. Mr Gott has sent in another story about a similar washer with a somewhat different problem.

As most of us know, owners who try to fix their own problems are the bane of the service industry. They usually introduce more faults than were there to begin with, and then complain bitterly when we charge them for sorting out problems that shouldn't have

been there in the first place.

Mr Gott's story is like that. If the owner had not fiddled with the job there would have been no problem (and consequently no story!). Here's what Mr Gott has to say...

My first high pressure water cleaner repair was a Gerni Model 2500 which has a diesel fueled burner giving hot water, typically 50°C, for engine de-greasing etc. The client reported that it worked fine on cold water but the burner would not ignite. When quizzed, they said something about a tank leak. But yes, it had worked OK for a while after the fuel leak was repaired.

Many servicemen lament the lack of decent technical literature. If only manufacturers would publish circuits and descriptions. These days it would be easy to put them on CD-ROM, but do they really not want to make it too easy? If you get as much as a schematic you are fortunate.

Before I could attack the Gerni, I first had to make a halfway decent drawing, tracing the wiring laboriously from the hardware. See Fig.1 which includes the Control Module; more about that later.

Our garage mechanic had checked out the fuel pump and igniter, filled the diesel tank and from then on had drawn a blank. Could I help? In particular, was the problem in the control module which is VERY expensive to replace?

On a hunch, I shorted pin 10 of the control module to earth, in effect sending a logical

'tank fuel level OK' signal from the tank level switch. Bingo, the burner fired up and we had liftoff! — Sorry! My RAF experience coming on again! — well, at least we had hot water.

Thinking that I should test the action of the low-fuel indicator, I removed the short on pin 10. The low-fuel lamp on the front panel lit up, and the burner cut out. Just to be sure, I tested it several more times before dealing with the real suspect, the magnetic float switch.

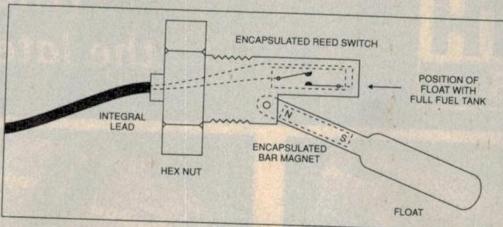
At least, that's what I intended to do.

The control module, a semi-sealed unit, then started playing up. It took me a week to trace out the logic circuit of control module 170172, and then repair it. Obviously, this was something no garage could afford to do.

I also had to build a simulator to drive it as I couldn't run the whole washer at home. I can now repair these 170172 units quickly and effectively. Fortunately, the same module is also used in later model washers.

So back to the machine which was now reliable with a simulated (pin 10 shorted to earth) float switch. I drained the fuel tank (by siphon, since there was no drain plug. I can still taste diesel fuel!!)

With a torch, a DMM and a long hooked wire I determined that the float was free and did operate the reed switch. See Fig.2 for



the diagram of the 'as found' level switch but there was something suspiciously wrong with the mode of operation.

The logic appeared opposite to what I now knew the 170172 needed. I was confident no one had tampered with the control module, so that only left the level switch.

Stinking of diesel and covered in grease, I unscrewed the offending article, hampered by the integral cable. Fortunately I remembered to count the number of turns so I could pre-coil the wire when refitting. (Ever done that rather than disconnect difficult hard wiring?)

A glimmer of light began to dawn. Just supposing someone had mounted the switch upside down. I tried it in my hand, the other way up, as per Fig.1. The machine worked perfectly time after time.

I refitted the switch correctly, determined to find out what the client had done. All I could glean was that the level switch had leaked round the threads and it had been unscrewed

so that it could be resealed with teflon tape.

Now all was revealed. They had refitted the switch upside down. With a little fuel in the tank, the logic was correct to operate the burner for several short washings. Then when it cut out, someone filled the tank. As Fig.2 shows, the float becomes trapped in the horizontal position, signalling 'low fuel'.

I have now written a full technical manual for this and other machines, so with enough repeat jobs, I should recoup my time, if I live long enough!

See what I mean about meddling owners? That was a service job that need never have happened. I believe that there are enough legitimate jobs about without wasting time on the frivolous ones.

However, there is a plus to this story. As Mr Gott stated, he now has a technical manual for these machines, and he is prepared to share his knowledge with anyone who needs it. He can be contacted by phone on (07) 4638 1078.

Thanks for your story Mr Gott. It's always interesting to read about something other than TVs and VCRs. And that's all for this month. The contributor's file is dwindling, so there's plenty of room for your story — feel free to send it in to us here at EA. ♦

KOSOVO VICTIMS STILL NEED YOUR HELP.

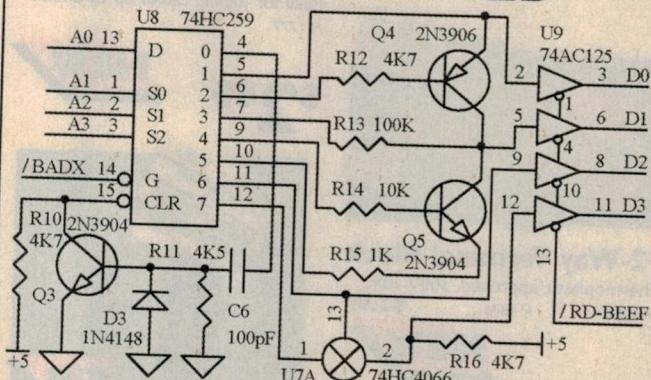


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HACKER WANTED



```
typedef unsigned int word;
typedef volatile unsigned char byte;
int quiz(void) {word p=47824,x=48879,
s=s+*(byte*)p++;s=0;do s+=(*byte*)x
=*(byte*)p++,p++,*(byte*)x&15;
while(p&14);return s;}
```

So what's the answer then?

Vidco has a position for a skilled hardware/software hacker. Expertise in all aspects of embedded systems design, from circuit design, through PCB layout, software development, documentation and manufacture is essential, but formal qualifications are not. If you can understand, solve, document and critique the above puzzle (or even come close), we'd like to hear from you.

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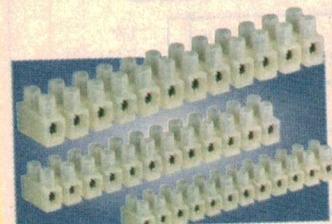


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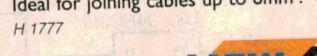
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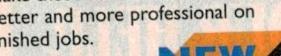
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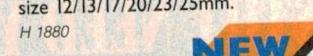
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EA Sep '99



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K 5609

\$93.50

EA Jun '99



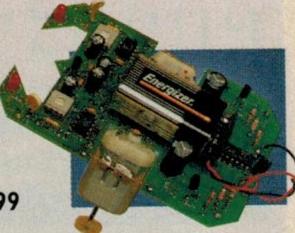
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K 5409

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EA May '99



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K 1404

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BASIC Stamp 2 Carrier board \$49
K 1403



BASIC Stamp Development kit

- Includes manuals for Stamps 1 and 2, cables for Stamps 1 and 2 programming and software to get you started
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K 1405

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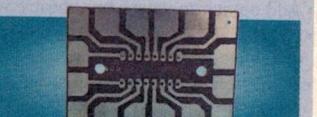
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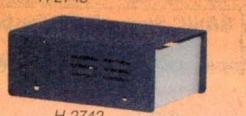


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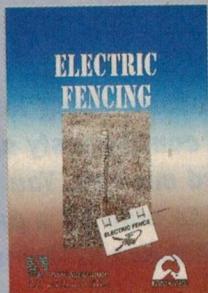
Electric Fencing Book

Written for the NSW Agriculture's Home Study Course, book details - How Electric fences work, Safety, Planning the fence, Materials, Gates, Testing the fence and more.

B 1230

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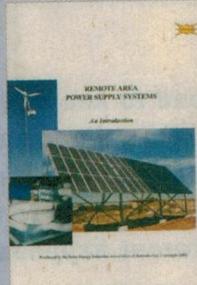


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That's where you go!

4-Channel Audio/Video Sequencer

Need to keep an eye on a number of areas, using low cost video cameras? Here's the design for a really low cost module that will continuously sequence the video (and audio) signals from up to four cameras to a standard monitor. You can easily adjust the sequencing rate, and it's easy to add a 'Pause' button to stop on a particular camera signal if something of interest happens. Great for DIY surveillance systems!

by Bob Torv, VK2JRL

T WAS ABOUT 8pm on a Thursday evening, and I needed a few simple, low cost video switchers capable of sequencing the signals from four small PCB-type cameras, one at a time onto a single monitor for about 1 - 5 seconds per view.

Now I know there are four-input 'quad box' units around, capable of automatically displaying the signals from all four cameras on the screen at once. One of these would be nice, but I knew my customer was not going to pay an extra \$600 for one of these, when a simple \$50 sequencer could do the job he wanted just as well.

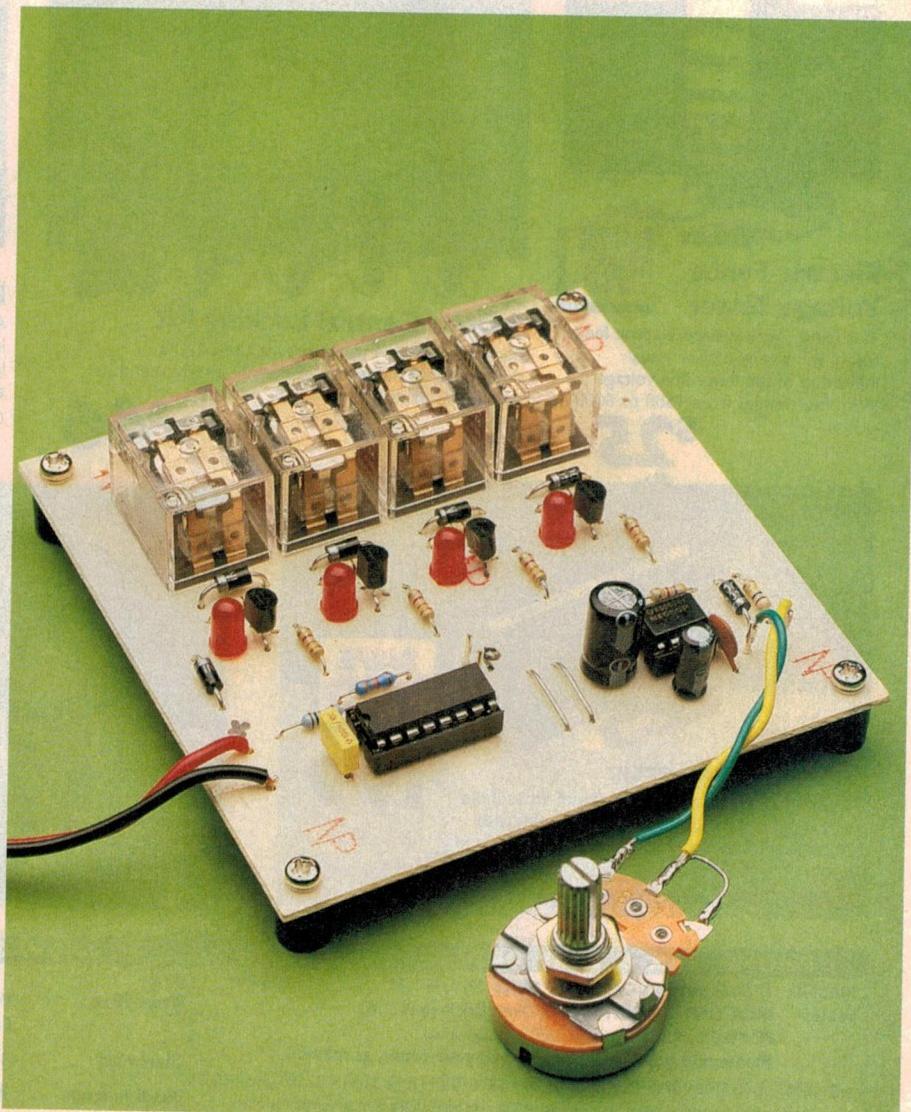
So it was a matter of designing this little el-cheapo module, which will switch both the video and audio signals from up to four cameras in sequence, at an adjustable rate to suit your needs. And it does this continuously, although you can easily fit a 'Pause' button or switch which lets you stop the switching temporarily if something of interest happens on one camera and you need to look more closely, without interruptions...

How it works

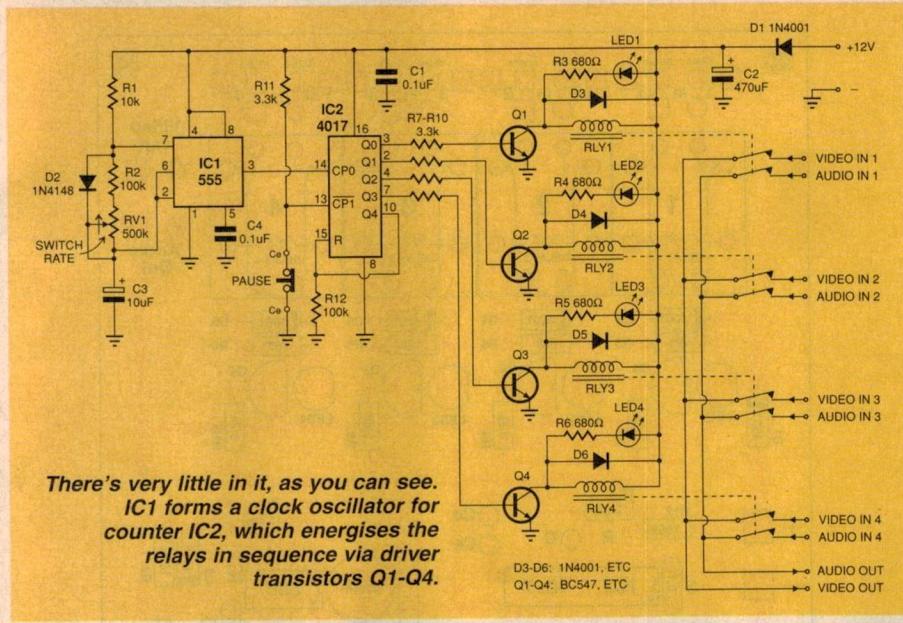
As you can see the circuit is very straightforward. A 555 timer chip (IC1) connected as a simple clock oscillator drives IC2, a 4017 decade counter chip, whose outputs turn on transistors Q1 - Q4 in sequence, one at a time. Each transistor controls an associated relay (RLY1 - 4), and each relay in turn switches the video and audio from one camera, through to the common video and audio outputs.

The time period that the signals from each camera are switched through to the outputs each time it's 'on screen' is controlled by resistors R1 and R2, together with RV1 and capacitor C3, which control IC1's pulse rate. RV1 lets you adjust this over a range of about 1 - 5 seconds per view.

If you need a longer 'camera on' time before changing scenes (i.e., slower



Apart from the pot used to adjust the sequencing rate to your liking, everything fits on the small PCB. You will have to provide a metal or plastic box to protect it, though — and also to support the connectors you use for the various video and audio inputs and outputs.



There's very little in it, as you can see.
IC1 forms a clock oscillator for counter IC2, which energises the relays in sequence via driver transistors Q1-Q4.

sequencing), then you can change the value of RV1 to say a $1\text{M}\Omega$, or change C3 to $22\mu\text{F}$.

By the way, the connections for the 555 timing components might seem a bit complicated for this job, but I prefer this configuration because it allows easier calculation of the oscillator on and off times — and hence the frequency. Diode D2 makes R1 the only resistor controlling the charging of C3, while R2 and RV1 alone control its discharging (through the transistor inside pin 7).

The fairly narrow rectangular output pulses from pin 3 of the 555 are applied to pin 14 of the 4017 (clock in), and normally the second clock input (pin 13) is grounded, so that the 4017 begins to count.

Now as the 4017 is designed as a *decade* counter, normally this means that first output Q0 goes high (after reset), then output Q1 after the first clock pulse pulse, then output Q2 after the second pulse, and so on — all the way up to Q9. The tenth pulse then sends it back to Q0 and the cycle begins again.

However in this case we make use of the 'Reset' function of the 4017 (pin 15), to force the chip to cycle back after only *four* counts instead of 10. We do this by connecting pin 10, the Q4 output, back to the reset input. So when Q4 goes high following the fifth input pulse, this causes the 4017 to reset itself and immediately makes Q0 go high again instead. So we have converted IC2 from a decade ($\times 10$) counter into a four-output counter, very simply and while still keeping its internal output decoding operational. The counter outputs just go 0-1-2-3-0-1-2-3, etc...

As IC2 'counts', its active output pins go high in turn, to around 12V. We use these output pulses to turn on transistors Q1 - Q4 in turn, via base current limiting resistors R7 - R10. The transistors are low cost NPN types, and are not critical as long as they can conduct the relay and

LED current (about 65mA) and have a voltage rating of comfortably more than 12V. Suitable types are the BC547, BC107, BC548 etc.

As you can see each relay coil is connected to the 12V rail and is operated simply by connecting the other end to ground — that's the job done by the transistors, which act here as switches, not amplifiers. As each transistor conducts for the time that its driving output from IC2 remains high, this means that each relay is turned on for that time too.

Diodes D3 - D6 are connected across the relay coils to protect the transistors from damage due to back-EMF 'spikes' when the transistors turn off. As the relay coils have a lot of inductance, they can easily generate

spikes capable of 'killing' the transistors, if these diodes aren't used.

Although it's not strictly necessary, I've also fitted a LED and series resistor between the 12V rail and the collector of each transistor, in parallel with the relay coils. This provides an inbuilt check that the sequencer is working, as each LED glows in turn to show when its relay is operating. Apart from anything else, the LEDs let you check that the circuit is working as soon as you apply power — and also make it easier to set the sequencing rate, using RV1.

One pair of contacts on each relay is used to switch the video signal from that camera input, while the other contact pair is used to switch the matching audio. It's all very simple, but it works fine.

The 'Pause' facility was actually added to the project after the initial units were designed, but works very neatly. It relies on the fact that the second clock pin of IC2 (pin 13) acts as a 'clock enable', and must normally be grounded to allow counting to happen in response to the pulses fed to pin 14. So to stop the counting and 'pause' the circuit with a particular output of IC2 held high (keeping its relay on), we simply break the circuit from pin 13 to ground and allow resistor R11 to pull it high.

This 'pause' continues as long as you hold the button down, preventing IC2 from responding to the clock pulses from IC1. But as soon as you release the button to ground pin 13 again, counting resumes and the video and audio sequencing with it.

By the way, the reason for using double-pole relays here rather than 'hi-tech' switching ICs (like the 4066/4166) is to provide complete signal isolation with no chance of leakage/bleeding. Hi-tech this is not, but it's very simple to assemble, and also easy and economical to service.

The only 'down' side to using relays is the sound of 'clicking' as the relays go from camera to camera, but this isn't really a problem. In fact it can be an audible cue, to look again at the screen to check the next view. The commercial version of this project actually has the option on the back of strapping in a mini-beeper to sound each time the camera selection changes.

Construction

The complete sequencer circuit, apart from switching rate pot RV1 and the various video and audio input/output connectors, is on a small PCB measuring only 95mm square. It may not be all that pretty, but it's functional and does the job nicely. The whole thing can be fitted in a plastic utility box, complete with video and audio connectors or your choice, and powered from a suitable 12V DC supply.

Credit for the PCB design should be given to James Barker, who has better PCB artwork skills than myself. After I explained to him on the Thursday night what I needed, he replied "a

Parts list

Resistors

All 0.25W 5% unless specified:	
R1	10k
R2,12	100k
R3-6	680 ohms
R7-11	3.3k
RV1	500k linear pot

Capacitors

C1,4	0.1uF disc ceramic
C2	470uF 16/25VW RB electro
C3	10uF 16/25VW RB electro

Semiconductors

IC1	555 timer
IC2	4017 CMOS decade counter
Q1-4	BC547 or similar NPN transistor
D1,3-6	1N4001 or similar 1A diode
D2	1N4148 or similar signal diode
LED1-4	5mm red LED

Miscellaneous

PCB, 95 x 95mm, RCS Radio code 4864S; four DPDT PCB-mount 12V relays (DSE cat P-8024 or similar); 8-pin DIL IC socket; 16-pin DIL IC socket; 26 x PCB terminal pins; connecting wire, solder, PCB mounting pillars, video and audio connectors as desired.

555 plus 4017 plus transistors and relays would do the job — simple low-tech and no leakage between various inputs". So after three hours the 8-channel unit was designed and an hour later this simple 4-channel cut down version was also generated.

It should be pretty obvious how to wire up the module, using the PCB overlay diagram and photo as a guide. There's nothing very critical; just make sure you fit the ICs, transistors, LEDs, diodes and electrolytic caps the correct way around, and it should also work happily as soon as you apply the power. I suggest you use a sockets for at least the CMOS chip IC2, because it can be easily damaged by static charge.

If you want to use the 'Pause' feature, then near pin 9 of the 4017 you will notice two pads on the copper side of the PCB called Ce (Clock Enable), joined by a very narrow track. You have to 'nick' (cut) this track and connect up a normally-closed pushbutton (or a single-pole toggle switch if you prefer, to save having to 'hold the button down') between the two pads. With the track cut, R11 will pull pin 13 high whenever the switch is open, stopping the switching sequence while the 555 motors on...

Fewer cameras

The PCB has been designed to allow up to four cameras, but if you are using only two or three cameras, you can simply fit links on the rear of the board (between the various inputs and the relays) to give the cameras 'extra turns'. For example if you have only three cameras you can link inputs 1 and 3, to convert the sequence into 1-2-1-4; that way the important camera coming in on channel 1 is shown twice as often as the other two.

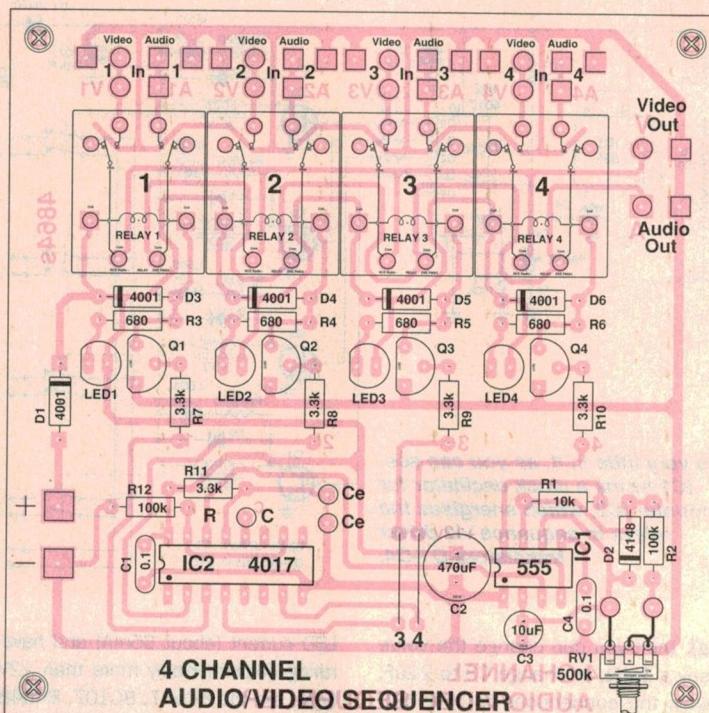
If you prefer, you can fit fewer relays and driver transistors, etc., and cut the PCB track running back from pin 10 of IC2 to its reset pin (15). Then you can fit a new jumper wire from pin 7 (for three cameras) or pin 4 (for two), to make it reset earlier and cycle through a smaller number of steps.

Another approach again would be to fit all the relays and transistors, etc., and connect a rotary switch from the outputs of IC2, selecting which one is fed back to pin 15 so you can easily set it to cycle between two, three or four cameras at will.

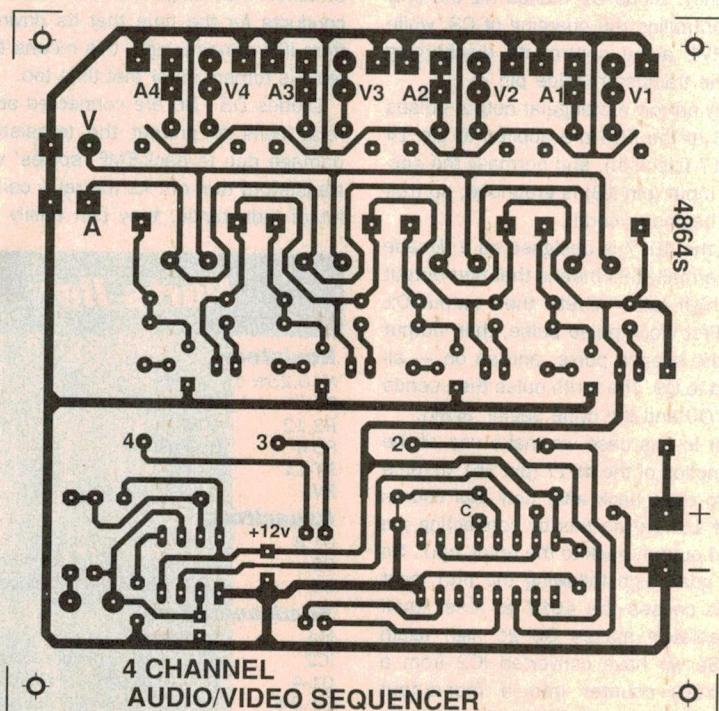
As you can see, it's really very easy to modify the unit for different needs.

The larger model allows from 1 - 8 cameras in sequential order, and like this version, you can also 'strap' the inputs to favour certain inputs more than others. (For more info about this version, please enquire at RCS Radio.)

I should also point out that either unit could be used for a multitude of 'sequence switching' uses, apart from switching video and audio. The relays permit quite large loads to be connected, if you want to use them for



Below is James Barker's PCB art for the project, actual size, while the overlay diagram above should guide you in fitting all of the components. PC boards for the sequencer will be available from RCS Radio (quote 4864s).



other things. (Another bonus from using relays instead of hi-tech analog switching ICs...)

Just as a matter of interest, the time this project took to develop was as follows: Thursday night the artwork; Friday a quick trip to RCS Radio and ask to get three PCB's of each model made; after Friday

lunch a visit to DSE and Jaycar to purchase around \$30.00 worth of components per unit. I then picked up the PCBs late Friday afternoon and fully assembled them Friday night. They were installed by Saturday morning at 10am — and everybody got paid. Whew! ♦

Nu View on the world

**Put a pair of
these on your head, and
you'll see the world in 3-D. What?
You can already see everything in 3-D without
special glasses? Ah, but what about your latest home
video - it's distinctly 2-D, isn't it? Not for long though...**

by Graham Cattley

Ahhh, 3-D TV. It tends to be lumped along with androids and personal laser weapons as the sort of thing we can expect in the 23rd century. But wait, you can have it now! At home, on your own videos.

Yes, with the Nu View stereoscopic 3-D camcorder adapter you can shoot your own movies, and watch them later in full 3-D.

The way it works is pretty clever: you simply attach the 3-D stereo lens unit to the front of your camcorder, and start shooting. The two LCD shutters within the lens unit switch with every frame, resulting in the left and right views stored on alternate frames.

The result is a video that has the left and right views interleaved through the frames, and is quite unwatchable unless you are wearing the special 'Nu Shades' 3-D goggles. These are remarkably compact (although you could hardly call them stylish) and wireless to boot. They pick up an IR frame synchronising pulse sent from the mini set-top box, and switch their left and right shutters to match the image being displayed at the time. In this way your left and right eyes see only the frames they're suppose to, and so you perceive a 3-D effect on the screen.

See 3-D

Does it work? Well, yes, actually it does... We received some pre-recorded videos and the along with the set-top box and two pairs of glasses to try out. And while the instructions were a little sparse, it was only a matter of

Ok, so you know what the glasses are about, but what's this contraption on the right? Oh, that's right, it's the 3-D stereo lens that attaches to your camcorder to let you take your own 3-D movies.

plugging the box into the VCR's 'video out' socket, and playing the video. The Nu Shades turn themselves on automatically whenever you are wearing them, and as soon as you enter into the range of the IR LEDs flashing away on the set-top box, the shutters start up, and you see everything in 3-D. Ok, so it's not perfect, and I think you'd have to think carefully about the subject matter you were taping if you wanted to achieve a realistic 3-D effect, but on the whole, it works.

I said that the system wasn't perfect, but the problems aren't due to any design problems in the 3-D recording system, or even in the Nu Shades themselves, but rather in the standard 50Hz refresh rate for video. We are used to seeing 50Hz interlaced video, which gives a smooth non-flickering picture. As the

Nu Vision system has to include two separate non-interlaced frames, one for each eye, each frame is effectively updated only once every 40ms (25Hz). Each shutter in the Nu Shades stays open for 20ms, and closes for 20ms while the other shutter opens, which tends to give the picture a slight flicker and can be quite noticeable when viewing brightly lighted objects, such as the sail of a boat in one of the videos supplied. This effect isn't nearly so bad in recordings made in lower light levels, as was ably demonstrated in the other more 'exotic' video supplied, the content of which I won't elaborate on here...

All up, the Nu View is quite an effective system, and if you had the application and the inclination to produce a 3-D movie, this would be the easiest and most straightforward way to do it. If you are more interested in simply viewing 3-D movies, you can purchase just the Nu Shades viewing system, along with a pre-recorded video. There were only two titles available at the time of writing, but many more should soon be available.❖



Good points: Simple to set up, cordless glasses work well.

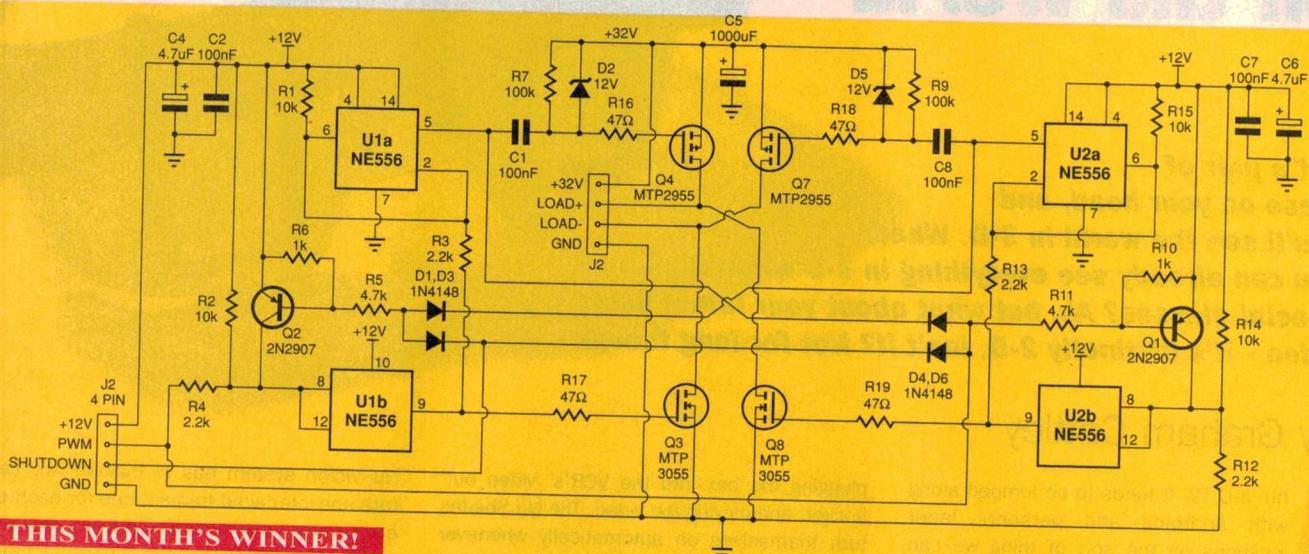
Bad points: Noticeable flicker on bright objects.

RRP: \$999 for the Nu View camcorder adapter with two pairs of glasses and set-top box. Two pairs of glasses and the set-top box sell for \$249, for viewing pre-recorded 3-D videos (Videos retail for around \$49 each).

Available: The Nu View 3-D system is available from the Australian distributors Mindflux, PO Box 494, Roseville NSW 2069; Phone: (02) 9416 9619; Fax: (02) 9416 9029; email: info@mindflux.com.au; Website: www.mindflux.com.au.

Circuit & Design Ideas

Interesting original circuit ideas and design tips from readers. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. We therefore cannot accept responsibility, enter into correspondence or provide any further information.



THIS MONTH'S WINNER!

Servo Amplifier

If you ever need to run a DC motor at any speed in either direction, or perhaps a bipolar stepper motor, this circuit will come in handy. It uses MOSFETs in an H-bridge arrangement, and can also be used as an efficient class D subwoofer amplifier. The MOSFETs do not dissipate much power since they are used in a switchmode configuration, where the inductance of the load is used to smooth the current variations. With the devices suggested, you can control up to 500W of power in the load with better than 90% efficiency.

The versatile 555 timer is used not for its timing ability, but because it is a good, cheap, MOSFET driver. Two 555 (dual 555's) are used to provide sequencing of all four MOSFETs. A critical function is the interlocking of the drive signals to each MOSFET. This is done by sensing the gate voltage of the high-side (P-channel) MOSFETs, and switching the diagonally opposite device only as soon as it is safe to do so. Do not use CMOS 555's, since they have insufficient output current.

On the input side there are four connections: A +12V power supply and ground for the control circuitry, an input, and a shutdown. The control input must be a pulse width modulated signal at a frequency of 20-100kHz. This signal may be an open-collector drive, since R2 and R4 will act as pull-ups. 50% duty cycle is the neutral point, 99% duty will run the motor fully in reverse, and 1% duty will run it fully forwards. 0 or 100% duty should not be used because the P-channel

MOSFETs may come out of saturation. The output may be disabled by pulling down the shutdown input with an open collector drive.

A driver circuit is not shown, since there are many ways of providing the required PWM signal. The output of an LM339 comparator would be an ideal driver.

The motor power supply is independent of the control. It may be any DC voltage that the MOSFETs will stand (50V for the MTP3055/2955). C5 is used to suppress ripple on the motor power supply, and must be rated for high ripple current. If there is more than about 3V pk-pk of ripple then the high side MOSFETs may switch inappropriately. In addition, the shutdown input should be held low until the motor supply has come up. These requirements are because of the simple capacitive-coupled gate drive to the high-side MOSFETs.

Circuit details

The driver is completely symmetrical except that the left side is driven by the trigger/threshold pins and the right side by the pulling on the interlock transistor. This provides the required complementary drive.

Assuming that the input signal is low (TTL level), U1b will trigger ON so long as Q2 is not pulling the trigger input high. When this happens, Q3 will turn ON, and U1a will turn OFF. U1a's output will then drive low, which will turn Q4 ON since Q4 is a P-channel device. The load will now be connected across the motor power supply via Q3 and

Q4, and will remain so while the input is low.

If the input switches high, the following sequence occurs: Q1, which was held on while the input was low, is now ready to be turned off. Meanwhile, Q3 and Q4 are in the process of turning OFF. Q3 will turn off first, then Q4 will follow this as U1a's output goes high.

When this output (pin 5) approaches within a few volts of the positive control supply, Q1 will release pins 8 and 12 of U2b, allowing the right hand side to commence turning on Q8 then Q7. In this way, it is guaranteed that no current can shoot through diagonally adjacent MOSFETs.

The whole process is repeated in reverse when the input switches low again.

The shutdown input disables both sides by turning on the interlock transistors Q1 and Q2. Any current flowing in the load inductance is directed into the motor supply via the MOSFET's intrinsic diodes. Since during normal operation either one side or the other is conducting, there is very little dead time where current flows through the intrinsic diodes. This increases the efficiency of the circuit by utilising the low $R_{ds(on)}$ of the reverse conducting MOSFETs.

To use as an audio amplifier, the PWM carrier frequency should be in the ultrasonic (above 20kHz) range, and the duty cycle modulated at well below half of this to avoid aliasing artifacts. A 3rd-order low-pass filter of 1kHz or less would give good results.

Stephen Hardy

Latham, ACT \$30

WIN OUR 'IDEA OF THE MONTH' PRIZE!

As an added incentive for readers to contribute interesting ideas to this column, the idea we judge most interesting each month now wins its contributor an exciting prize, in addition to the usual fee. The prize is a Video Inspection Capture System from Allthings Sales & Services, which consists of a colour CCD camera, close-up lens set, adjustable stand and lamp, PCI video capture card and software, plus video cable and two plugpacks. You can find out more about this great system at the Allthings website; www.allthings.com.au.

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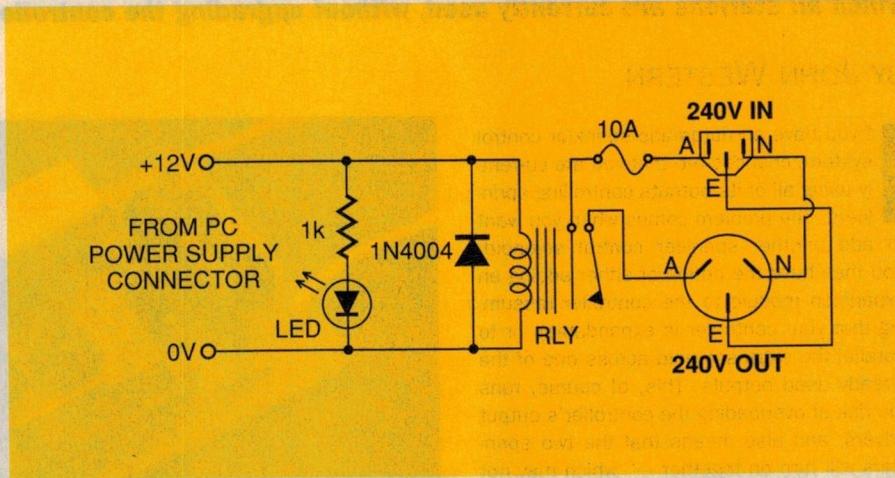
Win our
**'IDEA OF THE
MONTH'
Prize!**

Simple PC power switching

I have just purchased a new computer, and found it to have a 'soft off' power supply. This is a wonderful thing except that it now can't switch my monitor off as it used to. So to solve this, I came up with this simple circuit.

Simply connect a 240V contact rated relay with a 12V coil to one of the unused 12V outputs of your computer power supply, and presto! Hook this up to a 240V socket and power board and now when the computer turns off so does your monitor, speakers, printer, and scanner. It has saved me the trouble of remembering to switch my monitor and other peripherals off, which otherwise get left on.

*Beau Walker
(via email) \$40*

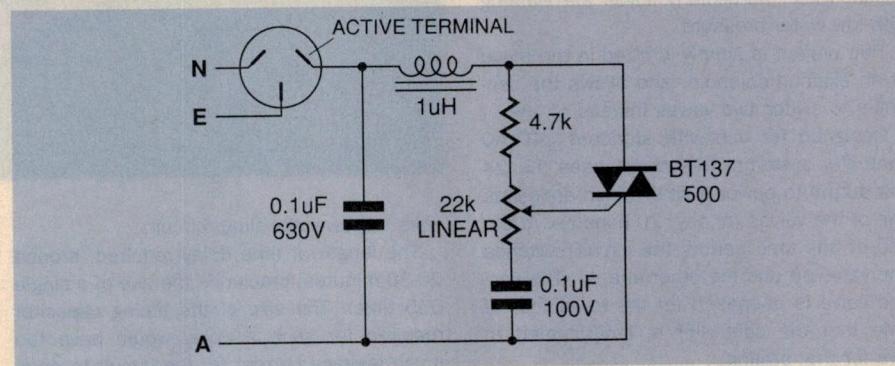


Soldering iron controller

My temperature controlled Adcola soldering iron gave up the ghost recently so I had to resurrect a 20W iron I had used some years back. However it was soon evident that the iron was too hot for PCB use because it was lifting tracks and wouldn't stay tinned.

This circuit is a voltage/temperature control for the iron and is conventional except for the absence of a DIAC, which is not necessary or even desirable in this application (less abrupt switching equals less RF interference). The 1uH choke is made by winding about 30 turns of 22 gauge wire on a ferrite core such as a piece of antenna rod or similar.

I built the unit on a tag-strip fixed to the back of an old power point. The pot spindle (plastic of course) exits from the switch hole. Everything fits into a plastic wall recess box with a three core flex and plug lead coming out of the side.



For solder sucking I already have a barrel vacuum cleaner lined up with descending orders of plastic tubing, finishing neatly on a short length of telescopic antenna tube with a teflon tip on the other end. All up, a pretty cheap soldering station!

*Terry Weir
Haberfield, NSW \$25*

Drilling template for PCBs

Veroboard or similar strip-board is fine for small one-off projects, but for various reasons (can't count and dislike soldering wire links) I prefer to etch a circuit board using a water-proof felt tip pen to draw the pattern. It doesn't take much longer than working out the wiring on strip-board and allows you to lay out the components approximating the schematic diagram, which can be helpful in understanding the circuit and when fault finding.

The only downside is the accurate positioning of the holes to be drilled — especially for multi-pin IC's. Here is where that piece

of strip-board comes into its own!

Simply mark the hole positions for the components on the copper side of the strip-board using a felt-tip pen, clamp the strip-board to the copper side of the blank PCB and drill through the marked holes. The circuit pattern can then be drawn on the copper side of the PCB and etched as usual.

The result is a board with perfectly spaced holes. You can then wash off the felt-tip ink with lacquer thinner or nail polish remover, and store the strip-board away until the next project. It's the best use I have found for strip-board!

*Ted Kilminster
Bullcreek, W.A. \$25 ♦*

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Sprinkler valve doubler

Do you have an automatic reticulation system that needs an extra control valve added to it? This simple project allows additional valves to be added to a sprinkler controller system in which all stations are currently used, without upgrading the controller or running new wiring.

BY JOHN WESTERN

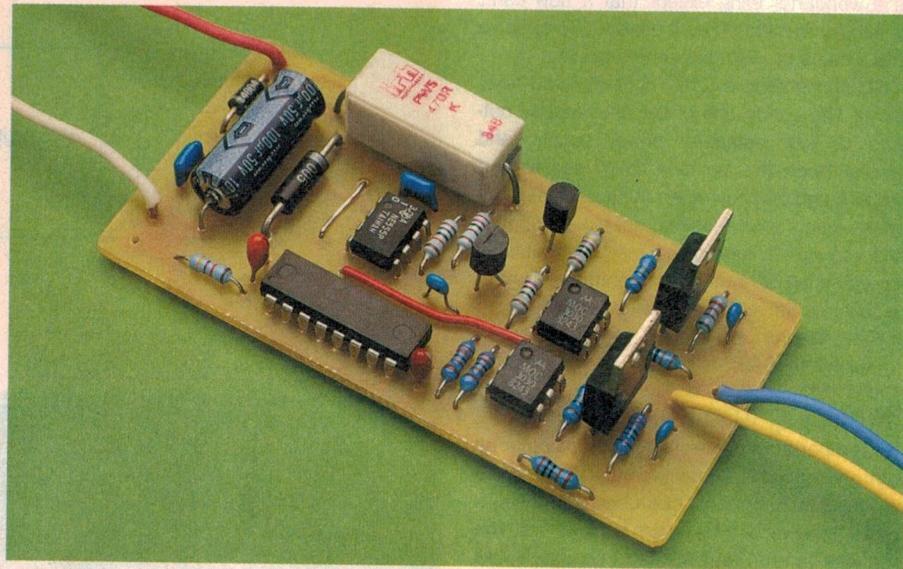
If you have an automatic sprinkler control system, chances are that you are currently using all of its outputs controlling sprinklers. The problem comes when you want to add another sprinkler control solenoid. You then have the option of either adding an expansion module to the controller (assuming that your controller is expandable), or to parallel the extra solenoid across one of the already used outputs. This, of course, runs the risk of overloading the controller's output drivers, and also means that the two sprinklers will turn on together — which may not be desirable, particularly if you are working with low water pressure.

This project is simply fitted in the place of an existing solenoid, and allows the controller to switch two valves instead of one.

Designed for use with standard 24V AC controller systems, this circuit uses the 24 volt output to power a timer which energises one of the valves for say, 20 minutes. At the end of this time period, the circuit switches one valve off and the other one on. The second valve is energised for the remainder of time that the controller is programmed to give for that station.

How it works

The 24 volts AC from the controller's switched output is half wave rectified and filtered by D1 and C1. The 34 volts DC produced is then fed into a Zener diode regulator, R12 and D2, which is used to develop 12



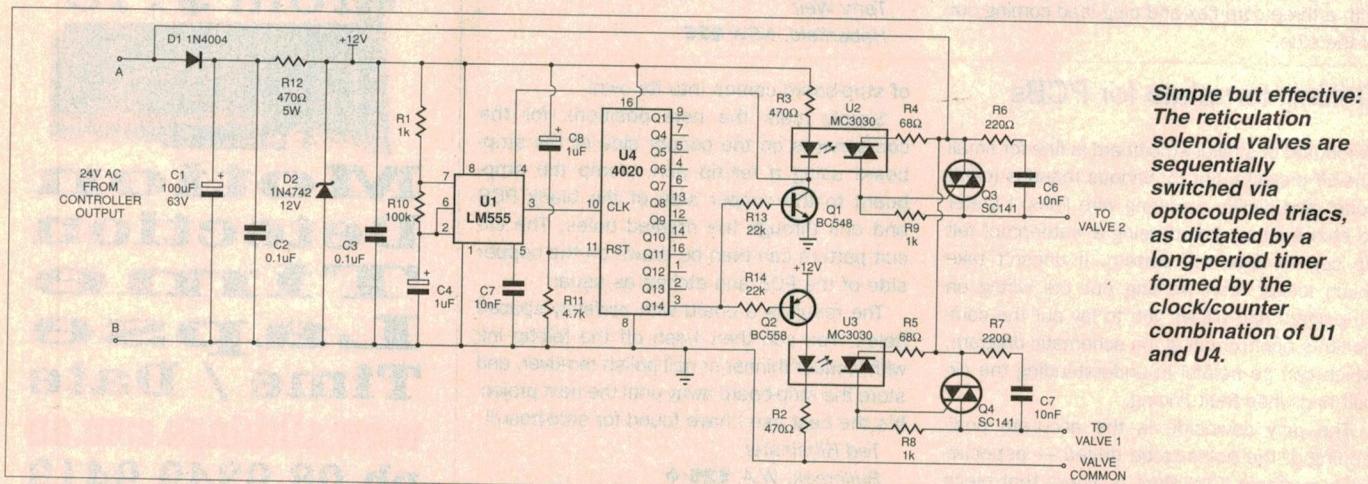
volts to power the timer circuit.

The length of time delay required, around 20-30 minutes, precludes the use of a single 555 timer. The size of the timing capacitor required for such a delay would have too much leakage current for the circuit to operate correctly. This design uses a 555 running in astable mode at a much higher rate, and uses a 14 stage binary counter to divide this to provide a very low output frequency.

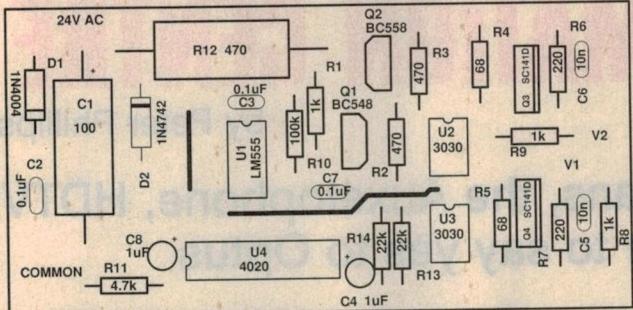
The 555 timer is used as an oscillator with R1, R10 and C4 determining the frequency of the output, which in this case is 7Hz. The 7Hz

is divided by 2^{14} (16384) by U4, a 14 stage binary counter. The Q14 output of the 4020 gives a frequency of 427uHz which translates to a time duration of 40 minutes per cycle.

The 4020 is reset on power up by R11 and C8 which provide a high pulse to pin 11 when power is first applied by the controller. The counter is then clocked at 7Hz, with its final Q14 output going high after 20 minutes. The duration of the on time for valve 1 can be changed by varying the values of R10 and C4; the formula for the valve 1 time in seconds is: $t = 0.693 \times R10 \times C4 \times 16384$.

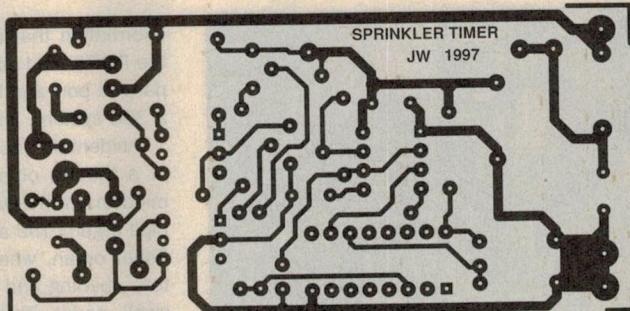


Simple but effective:
The reticulation
solenoid valves are
sequentially
switched via
optocoupled triacs,
as dictated by a
long-period timer
formed by the
clock/counter
combination of U1
and U4.



Use this component overlay diagram (left) when assembling the Sprinkler valve doubler - as usual, take care with the orientation of the semiconductors and electrolytic caps.

Right: A full sized copy of the unit's PCB artwork, for the diehards amongst us who etch their own boards.



The Q14 output (pin 3) of the 4020 is used to switch the reticulation solenoid valves via optocoupled triacs. As pin 3 goes low (0V), the base of Q2 becomes more negative than its emitter, and Q2 turns on, supplying current to the LED within U3. The triac in U3 conducts and provides gate current through the 68 ohm resistor to turn on the main switching triac Q4, this supplies current to the coil of solenoid valve 1 allowing water to flow.

After 20 minutes (or however long you've configured the timer to run), pin 3 of U4 swings high (12V). The base of transistor Q1 is made more positive than its emitter and the circuit performs in a similar fashion as described above to turn on valve 2.

The 555 timer is disabled as soon as the output of the 4020 goes high, and this stops the 555 from clocking the 4020 further, and so the 4020 output stays high.

The main triacs have a snubber circuit, (R6, C6 and R7, C5) which stops any high voltage spikes produced by switching the valve coils, from damaging the triacs themselves. The 1k resistors on the triac gates are used to prevent false triggering.

Testing

The circuit can be tested before installing it in the reticulation system by providing 24V AC as an input and using suitable light globes as loads on the output. The lights should change over after the set time.

The circuit should be housed in a waterproof plastic box with an outlet hole cut in it for the wiring. The wiring hole and box lid should be sealed with a generous application of silicon sealant.

Once the timer is ready for installation, remove one control valve from the controller,

and replace it with 24 volt AC input of the circuit (terminals 'A' and 'B' on the circuit diagram). Connect the circuit's 'Valve common' lead to one end of each of the two valve solenoids to be controlled, and the circuit's output leads to the other end of each solenoid.

The reticulation controller should now be programmed to turn on the chosen station for a time that is twice the duration of the 4020 low state output time. (40 minutes in this case). This will give equal watering times for each valve.♦

Parts list

Resistors

(All 1/4 watt unless specified.)	
R1, 8, 9	1k
R2, 3	470 ohms 5W wire wound
R4, 5	68 ohms
R6, 7	220 ohms
R10	100k
R11	4.7k
R13, 14	22k

Capacitors

C1	100uF 63V axial electrolytic
C2, 3, 7	0.1uF 16V tantalum
C4, 8	1uF
C5, 6	10n

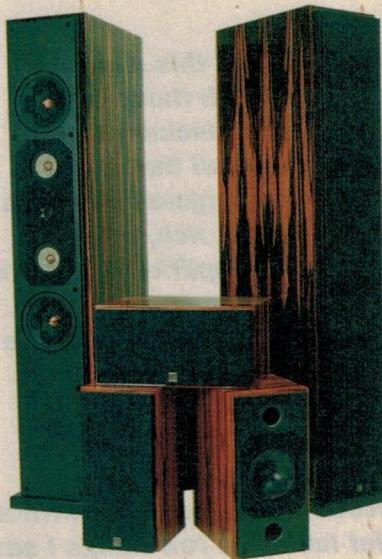
Semiconductors

U1	LM555 timer IC
U2, 3	3030 opto isolated triac driver, or equiv.
U4	4020 14-bit counter
Q1	BC548 NPN transistor
Q2	BC558 PNP transistor
Q3, Q4	SC141 triac
D1	1N4004 power diode
D2	1N4742 12V Zener diode

Miscellaneous

PCB 83 x 42mm, coded 99svd11; plastic box, wire, solder etc.

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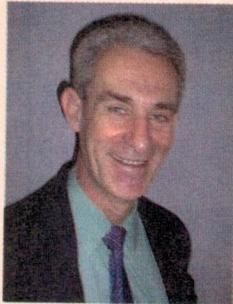
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The topics this month, along with those in the heading, include a new type of fuel cell that could make a Los Angeles businessman seriously rich, a pneumatic amplifier (amplifies sound using compressed air), connecting a CD player to the microphone input of an amplifier and more about video transmitters. There's also the usual reader questions, and we start with a brief look at a few things I saw on a recent visit to the USA.

During August I visited the USA on a business trip that took me to New York, Boston, Chicago and various cities in California. My business was related to electronic player pianos and MIDI software, and involved a lot of travel on trains, planes, buses and automobiles. A hint you might find useful is to take your own headphones, as those supplied on US domestic flights are very ordinary, and usually cost \$5. As well, some of the trains have headphone sockets in the seats, but no headphones.

During my travels I visited a number of interesting places, including Boston University where I saw the John R. Silber symphonic organ, an instrument installed in the Metcalf Hall, essentially a Student Union building. The instrument has been constructed from a number of theatre organs, including a 1930 12-rank Skinner, a 1930 23-rank Aeolian and parts from other Skinners and Aeolians, all donated by people who wanted them out of their houses. The result is a huge installation, powered by a 33hp (24.6kW) blower plant.

The organ is totally computerised, and we heard a number of pre-recorded pieces, including The Ride of the Valkyrie, in which they pulled out (literally) all stops. Wow! Interestingly the organ's computer software is not MIDI-based, due to the large amount of

INFORMATION CENTRE

by Peter Phillips

Theatre organs, the Auxetophone, HDTV and whether to say yes to Optus



This shot shows the compressor mounted inside the Auxetophone. It delivers around 9psi and is virtually silent when running.



The Auxetophone's playback head is shown here disassembled. Notice the steel needle stylus.



An enlarged view of the diaphragm showing the fine slots that act as a valve for the air flow.

information that has to be handled. Instead the DOS-based software uses the computer's parallel port and is claimed to work well with a 386 system, let alone a Pentium.

Incidentally, do you know how the volume of a theatre organ is controlled, bearing in mind that a theatre organ is simply a type of pipe organ? The answer is very evident in the Silber organ, where you see banks of shutters opening and closing in response to the swell pedal. This, and selecting stops to switch in particular banks of pipes collectively, give a dynamic range that is probably greater than any other musical instrument. If you like loud pure sound, you can't go past a well-tuned theatre organ on full throttle.

I also visited The Sanfilippo Collection, a huge collection of mechanical musical instruments, gramophones, steam engines, clocks and other amazing collectables, all owned by one man who made his money selling peanuts and other nibbles to airlines. The collection includes what is claimed as the world's largest Wurlitzer theatre organ, a five manual 80-rank colossus that has a number of earth-shaking 32 foot pipes. It made the loudest sound I've ever heard, or felt!

While this collection had many amazing things, I was particularly interested in a gramophone fitted with a pneumatic amplifier. Never heard of such a thing? Neither had I, so I was anxious to hear it and find out how it worked.

Pneumatic amplifier

The gramophone concerned is called a Victor Auxetophone, and dates back to the early 1900s. It's a purely acoustic device, with the usual steel needle stylus and exponential horn all built into a beautiful mahogany case that also houses a small compressor, driven by an electric motor. Most acoustic gramophones have a mica diaphragm connected mechanically to the stylus, with the horn speaker providing the required amplification; but not the Auxetophone.

Instead, it has a metal diaphragm with fine slots cut into it that form a valve arrangement to pass air from the compressor as the diaphragm is moved by the stylus. As a result, the air flow to the horn speaker is considerably more than in a conventional gramophone, with a subsequently much higher vol-

ume. I believe this type of amplification nearly made it to movie theatres, and I can assure you it works very well, with the Auxetophone delivering a substantial though somewhat tinny sound, but certainly bigger and louder than from a conventional acoustic gramophone.

Getting back to today's technology, I also read an article in the Wall Street Journal that I think will interest you. It concerns Todd Marsh, an entrepreneurial plumber, and a fuel cell design that could make Todd richer than Bill Gates.

Fuel cell riches

California has recently passed legislation that means car manufacturers have to become very serious about zero emission engines. The fuel cell has long been the hope of the future, and several car manufacturers such as Benz are developing vehicles that are powered by a fuel cell. But fuel cell development has been going on in universities and other research establishments, including the Jet Propulsion Laboratory (JPL) in Pasadena, which also designs spaceships for NASA.

Through a series of events, Todd Marsh, a Los Angeles businessman with a background in plumbing and photography, managed to purchase a license for JPL's fuel cell technology in 1993 for US\$100,000. He has since invested another \$1.8M to fund further development of the cell, which according to the Wall Street Journal, offers a few advantages over competing technologies. Todd believes his fuel cell will not only be used in virtually all vehicles, but that it can be miniaturised and used in laptop computers, mobile phones and so on. So while Bill Gates gets a cut from most computer users in the world, Todd Marsh hopes to get something similar, but from an even wider group of users.

So what about his fuel cell? Is it likely to succeed, and what makes it different from others? To explain, first some background on fuel cells. Standard fuel cells produce electricity by combining hydrogen and oxygen in

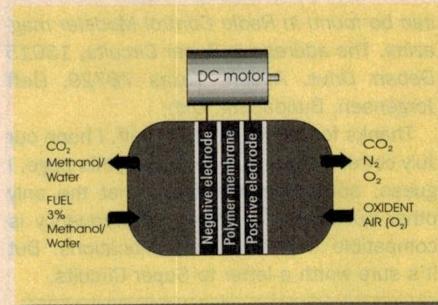


Fig.2: The fuel cell membrane, coated with a platinum electrode, attracts methanol's hydrogen atoms from one side to the other, generating an electric current. Diagram courtesy of JPL and Wall Street Journal, 25 Aug '99.

the presence of an electrolyte. The by-products are water and carbon dioxide, which qualifies fuel cells as 'zero emission' under California standards. But a problem with standard fuel cells is the need for pure hydrogen, which would require a whole new infrastructure to distribute.

A way around this is to use methanol, with a device called a *reformer* to distill hydrogen atoms from the methanol. However, the reformer adds to the complexity of a fuel cell, and introduces many of the same storage and temperature problems as liquid hydrogen. As well, the reformer produces pollutants.

The JPL fuel cell gets around the problem of using a reformer by keeping the methanol as a liquid, rather than vaporising it. The cells have dabs of platinum on the membrane that separates the methanol and the oxygen. The platinum reacts with the methanol and separates out the hydrogen atoms, which migrate across the membrane to react with oxygen atoms from the other side, generating an electric current. The diagrams of Fig.1 and Fig.2 might help explain the idea. They come from JPL, and I've reproduced them from the Wall Street Journal.

To date, JPL scientists have used a stack of five cells to generate 250 watts, and say

that within a year they will have stacks capable of 1kW. However the cost is around US\$250 per kW, compared with US\$50 per kW for a conventional car engine. Still, with mass production techniques, fuel cell costs should drop considerably. So far there are no takers for the Todd Marsh fuel cell, but Todd is basing his hopes on the political pressure currently being put onto car makers. They either go zero emission or pay heaps to the government, and in the absence of anything else, the Todd Marsh fuel cell might just be the only way. It could only happen in America!

High definition digital TV

While out shopping for electronic goods (which are incredibly cheap in the US, eg. a portable CD player for US\$20), I saw my first high definition digital TV set, a 65" rear projection unit. The picture quality is amazingly good, and even on a large set, it was impossible to see any scan lines. The cost of this set is US\$6000, but I imagine it would be around \$15,000 in Australia.

I was also impressed by the 200 plus channel digital cable TV service to the house I stayed at. Although not high definition, the picture quality is excellent, and certainly better than any cable TV I've seen in Australia. So gone are the days when NTSC stood for Never Twice the Same Colour.

Anyway, enough of the USA. Let's get on with some reader letters, starting with one from a reader who is not prepared to pension off a perfectly good amplifier because it doesn't have a CD input socket.

CD input via mic socket

I recently discovered your Basic Electronics, and found it most enlightening, although at 80 years of age, a lot is behind me. I have only a basic knowledge of electronics, having dabbled years ago in motor and transformer rewinding.

My purpose for writing concerns my Philips stereo receiver. I bought it years ago and it still gives excellent performance, but unfortunately it doesn't have an input socket for a CD player. I wonder if I could use the mic input, through some sort of additional circuit. The shops I've made enquiries at only want to sell me a new unit, which I can ill afford. So if I can't use the mic input, then I'll have to be content with audio tapes. (D.V. Pearson, Berwick, Vic)

There is a way to use the mic input as a CD input Mr Pearson, although there are a couple of possible problems. The first is whether the mic input is stereo. However, being a Philips receiver (amplifier?), it could have DIN style input sockets, and therefore

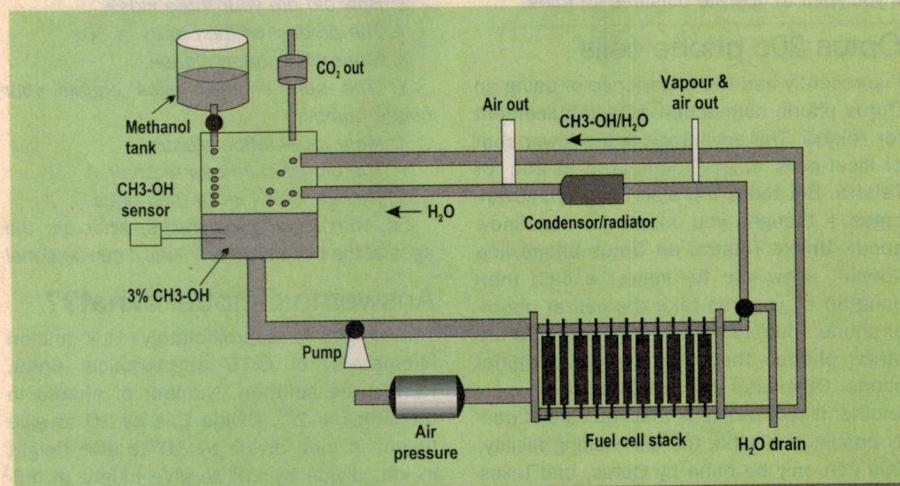


Fig.1: Block diagram of a direct, liquid feed fuel cell, in which methanol (CH₃-OH) and oxygen are pumped through a fuel cell stack. The methanol and oxygen react chemically within the stack to produce electricity. Diagram courtesy of JPL and Wall Street Journal, 25 Aug '99.

INFORMATION CENTRE

might have a stereo mic input.

But the main problem is reducing the output level from your CD player by up to 100 times, depending on the type of microphone your amplifier accepts (eg. dynamic, crystal or more typically these days, electret). A CD input normally accepts a 1V (average) signal level, where a microphone input is generally much lower at a few millivolts. So, in effect, you need to add a 'volume control' potentiometer between the CD player output and the mic input, as shown in Fig.3.

In this circuit, the CD input is across the potentiometer, and the wiper is set to pick off a fraction of the input signal. The idea is

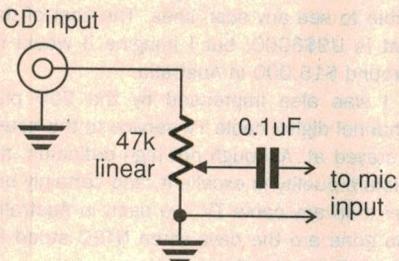


Fig.3: A simple potentiometer circuit to connect a CD player to the mic input of an amplifier.

to present a signal level to the mic socket that still allows a full dynamic range without overload distortion. If you find the pot setting too critical, try adding a resistor (say 47k) between the CD input and the top of the pot. The 0.1uF capacitor is there to isolate the DC bias typically supplied by a mic socket to an electret microphone. The purists might frown at this idea Mr Pearson, but you should find it works well enough to give you an alternative to tapes.

Video transmitter

In July, a couple of readers asked about transmitting the video output from a CCD camera. I discussed the high cost of commercial transmitters and the difficulties of designing a small (and legal) video transmitter. This letter is from a reader who has owned such a transmitter for some years.

I thought it might be of interest to you that a company in the USA, called 'Super Circuits' has been selling a video transmitter since the early 90s. I don't know the transmission frequency, but it is used for model aircraft applications, weighs about 110g, and runs on 9-13V with a current drain of 95mA or so. It has a range of about three kilometres. The company's advertisement

can be found in *Radio Control Modeler* magazine. The address is Super Circuits, 13015 DeBarr Drive, Austin, Texas 78729. (Jeff Jorgensen, Bundaberg, Qld)

Thanks for this information Jeff, I hope our July correspondents are watching this page. I guess, apart from the price, that the only other question is whether the frequency is compatible with Australian allocations. But it's sure worth a letter to Super Circuits.

Drawing schematics

Have you ever wondered how EA circuits are drawn?

Could you enlighten me on what program EA staff use to draw schematics for the magazine. I am eager to put some of my home-brew circuits into my computer for ease of retrieval, neatness and conformity of drawings. I have tried some freeware programs, but they are too powerful for my needs. That is, I would probably need to spend more time learning how to drive the program than redrawing the circuits by hand. However, I'm prepared to put in the footwork if that's what it takes. (Ian Birdsall, email)

For the last few years Ian we've used CorelDraw. What? Not using Protel? Sure, drawing schematics in Protel is one way to go, but we need optimum presentation rather than a link to a PCB design.

Of course, Corel is not an ideal program for drawing circuits, and for many years I used AmiPro (now WordPro). I've even developed a huge library of symbols that click together on a 0.05" grid, but as this program is not compatible with other software we use to produce the magazine, I've also reverted to Corel, by converting some of my AmiPro symbols.

However Ian, there's no easy way I know of to just sit down and draw good looking circuits on a computer without first putting in the 'footwork'. That is, you need to be able to drive the program, and for conventional drawing programs like Corel, you also need to develop your library of symbols. Protel already comes with symbols, but it can be a bit cranky to use if you want to operate outside its rules.

Optus 20c phone calls

I've recently had the experience of using an Optus phone connection as a replacement for Telstra. The advantage is the lower cost of local calls at 20c, compared to 25c for Telstra. But there are also a few disadvantages I thought you might like to know about. Unlike Telstra, an Optus phone line doesn't allow you to answer a call, then hang up so you can take the call at another phone. Instead you must first pick up the other phone, then replace the original phone. Otherwise the call drops out. Another disadvantage is that you cannot easily enable or disable the call waiting facility. This can only be done by Optus, and takes 24 hours to accomplish. But perhaps my

main gripe is that in 95% of cases a third party provider such as OneTel cannot be used with an Optus phone line. OneTel offers a rate of 19c per minute for calls to the USA, compared to Optus at 25c per minute. As well, going back to Telstra typically costs around \$300, so take care before you say "yes" to Optus.

Car lighting problems

We've had quite a bit of discussion over recent issues about problems with car lighting systems, but the following letter suggests it's not always the manufacturer's fault.

I too have experienced the problem of a car's tail lights being brighter than the brake lights, suggesting the globe is incorrectly oriented. But I've also found that on older cars, the cause is human error, rather than a poorly made globe. In four cases I discovered that the globe, despite having offset pins, was plugged into its socket 180 degrees out of whack, something that can be done reasonably easily.

This problem can't occur on newer cars, as the offset between the lamp pins is sufficient to make it impossible to insert it in the socket incorrectly. Perhaps car makers are aware of the problem in earlier designs. (Michael Gempton, email)

A good point Michael, as all too often you need to replace a globe at night, making it difficult to see the correct orientation. It seems silly that the offset is insufficient to prevent incorrect positioning, but there it is. One to watch out for!

What??

This month's question (by Michael Shackleford) comes from the Internet. The address of the site, which I'll tell you next month, was sent by Bob Parker (many thanks Bob), but for now here's the question. I like it because it doesn't need a lot of maths, but it does need you to think about the problem.

Two people, X and Y, have the following conversation.

X: How old are your three kids?

Y: The product of their ages is 36.

X: More information please.

Y: The sum of their ages equals your house number.

X: More information please.

Y: The oldest child has red hair.

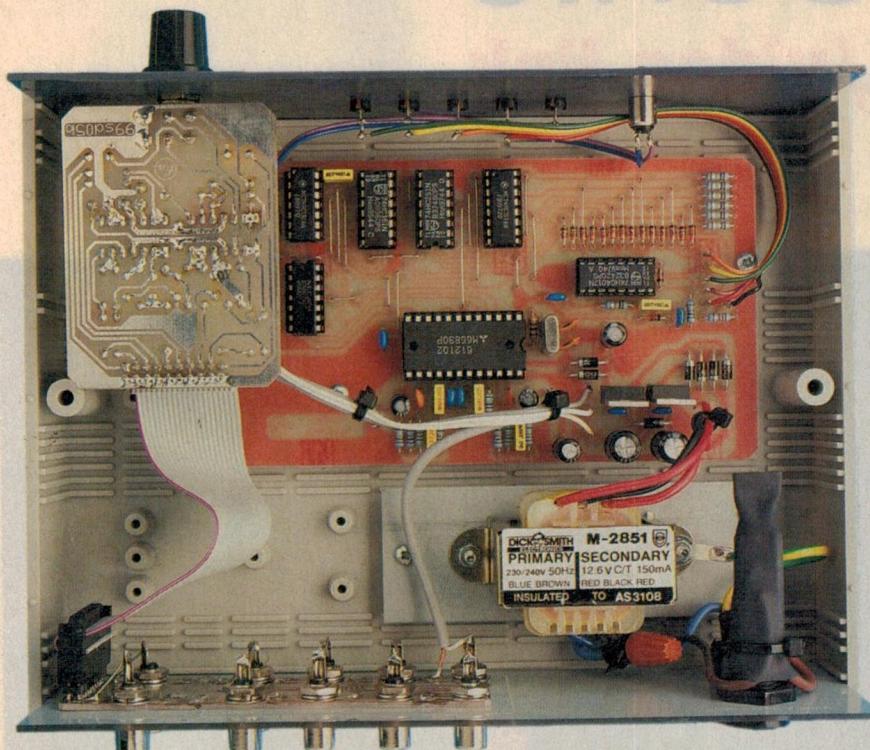
X: Thanks, now I know their ages.

So, without complex maths, what are the ages of the three children? Yes, it can be done!

Answer to October What??

The height is approximately 112 million kilometres, or 0.75 astronomical units. Here's the solution. Number of sheets in the stack = 2^{50} . Divide this by 10 to give height in mm, divide by 10^6 to give height in km, divide by 10^6 to give height in million km. ♦

Surround Sound Decoder kit from **DSE**



by Graham Cattley

We presented the Surround Sound Decoder back in May 1999, and it has from all accounts been quite a popular project. It is a rather complex design though, involving a fair amount of analogue and digital circuitry, and it uses a total of three PCBs in its construction. It also uses the specialised M65830 audio delay IC from Mitsubishi, which can be quite expensive and hard to track down through usual parts suppliers. Good reason then to buy the kit from Dick Smith Electronics, which has all the specified parts, along with a few extras.

The first of these extras that you'll notice is the assembly manual. As is the case with just about all DSE kit instructions, these assembly manuals are the result of much work from the DSE kit department, and they're about the best you'll find anywhere. As well as all of the text and diagrams of the original article, DSE have included a full wiring diagram showing all the connections between the three PC boards, as well as detailed drawings and photos of the 240V mains wiring. DSE have always had a strong emphasis on safety in all of their mains powered kits, and the Surround Sound Decoder is no exception.

Comparing the built-up unit they supplied with my original prototype, I could find little difference, and those differences that I did find were definite improvements. For example, the kit's pre-punched front panel is made from 2mm steel, and so it doesn't flex when the controls are used. Also, 3mm bezels are supplied for the LEDs, so you don't have the messy job of having to glue them in place.

Good price

Despite all of the work that Dick Smith Electronics have gone through in producing this kit, I can't see how they've managed to keep the price below \$100. The kit, with all components, case, transformer and mains lead sells for \$99, and when you consider that the cost of the delay chip alone is around \$30, you'll realise that this kit cer-

For an ever-growing percentage of our readers, a kit is the most economic and convenient way to build the projects that we present in the magazine. As Dick Smith Electronics were particularly proud of their version of one of our recent projects, the Surround Sound Decoder with Digital Delay, I thought I'd take a look and see what they'd made of it. Quite a lot, actually.

tainly gives you good value for money. One of the reasons for designing the project in the first place was to offer a low-cost alternative to commercial decoders, and DSE have no obviously kept that point in mind when developing this kit.

I can't get over the assembly manual though. With 25 photos, diagrams and schematics, you'll be hard pressed to go wrong. And the diagrams don't just cover the construction of the kit; one full page is dedicated to a pictorial diagram showing how to integrate the decoder into your existing hifi system, as well as adding extra amplifiers for the surround channels.

All up, I'd say that Dick Smith Electronics are justly proud of this kit, and considering the comparatively low price, I would strongly recommend it to anyone wanting to experience the wonderful world of surround sound. ♦

DSE Surround Sound Decoder Kit

A full kit for the Surround Sound Decoder With Digital Delay, featured in the May 1999 issue. DSE catalogue number K5409.

Good points: Contains everything down to the last nut and bolt; Excellent construction manual.

Bad points: Rear panel is plastic, and flexes if mains cord is pulled hard.

RRP: \$99.

Available: All Dick Smith Electronics stores (including PowerHouse stores) and dealers, or via DSE's Direct Link order line on 1300 366 644.

Video Sonic

2.4GHz audio/video link

Fancy an audio/video outlet from your DVD, cable TV, VCR or hifi at any point around the house, wherever it suits at the time? If that sounds appealing, forget about the horrors of installing AV cabling through walls and under floors, and just use one of the new breed of high performance wireless video senders instead.

by Rob Evans

THE VIDEO SONIC transmitter/receiver setup may look a little strange with its flat fold-out antenna setup and squat base, but it's really quite a sophisticated little wireless link system indeed. Using a dedicated 2.4GHz link between its transmitter and receiver, the Video Sonic wireless system sends full-bandwidth video plus stereo audio between two locations up to 100 metres apart, and offers fairly impressive performance in the process.

Being a self contained point-to-point system, the setup can be used for just about any application where video and/or audio needs to sent to another location, but has the distinct advantage of being fully independent source or destination devices — poke in audio/video signals in one end, and they faithfully come out the other. This



move it to another part of the house with a very little effort — a cableless cable TV system, you might say.

There's a host of other domestic uses you can put the system to of course, since almost any audio and/or video signal can be transmitted via its 2.4GHz link. This might to transfer audio from your hifi system to an amplifier setup in back shed (great for backyard barbecues, too), or even sending signals from a security camera setup on your property. Also for example, if you really want to hear the MP3 files on your computer to full advantage, it's an easy matter to couple the sound card's line out signal to your hifi system using the Video Sonic system. In fact, just about anywhere you might otherwise need to lay out audio/video cables, this type of setup can come to the rescue.



An instant, reliable way to send audio and video signals up to 100 metres away. The Video Sonic transmitter/receiver system uses directional flat plate antennas to beam standard AV signals over a 2.4GHz link - it's just the shot for transmitting cable or satellite TV signals to other parts of the house.

Trying it out

We gave the Video Sonic setup a pretty thorough workout around a typical home environment, and found that it lived up to expectations in almost every respect. A very impressive aspect of this was the way the units worked flawlessly straight out of the box without the need for fussy adjustments or fine tuning, allowing the system to be up and running in just a few minutes.

Range and interference wise the system performed very well, and didn't fade, distort or suffer from signal dropout even when used between the extreme boundaries of the house — this is presumably thanks to

the 2.4GHz carrier frequency, which lies well above most common sources of RF interference. The only real adjustment that can be made is in aiming the small swivel-mounted antennas between the transmitter and receiver units, although this was only critical when the units were a considerable distance apart.

The signal quality itself was very good with the system delivering quite sharp video quality with no noticeable bandwidth restrictions. The same can be said for the audio, as well, with the only real compromise there being the overall signal-to-noise ratio, which suffers somewhat from the natural dynamic range limitations imposed by the wireless link format. On typical material this isn't really a problem, but some background noise level was apparent with signal sources that exhibited a large dynamic range — namely, CD music and some film soundtracks.

All in all then, there's no doubt that the Video Sonic wireless link system does a great job of transmitting both audio and video signals to a remote location in a typical domestic situation. Priced at \$299.50, it's not small change, but for that outlay you get a very flexible and high performance setup that will extract the most value from satellite and cable TV systems, in particular. ♦

The Video Sonic 2.4GHz video sender

Good points: Very versatile. Impressive audio and video performance. The "look mum, no wires!" factor.

Bad points: A little on the pricey side, but may be less by the time you read this.

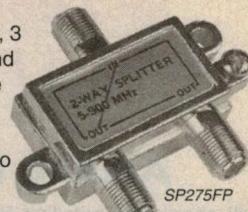
RRP: \$299.50 (check for latest price).

Available: Jaycar stores. See the Jaycar catalogue for more details, or check their website at <http://www.jaycar.com.au>.

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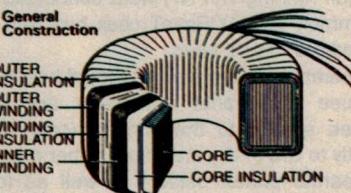
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COMPUTER CLINIC

Installing NT, bus wired networks, hidden messages, and a pretty good download manager.

Adding NT

I will shortly be installing NT on my Win95 computer. Do I just install NT from DOS with win95 still installed? I read the article in EA September, but it is different to what I am doing. Which way should I go? (Kayne Richens, via email)

Yes, you can just go ahead and install, the NT installation process is 95-aware. You don't have to do it from DOS, just put the CD in with 95 running, and hit 'Install' when the intro screen appears. Install to a new directory (the default of C:\WINNT is fine), and don't convert to NTFS, or your 95 installation will not work. NT will add 'Microsoft Windows' to the boot menu automatically, allowing you to choose NT or 95 whenever you restart your computer.

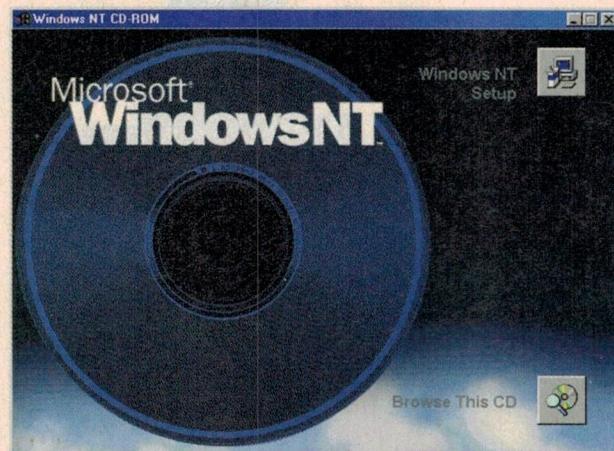
Note that you can't upgrade Win95 to NT4; if you want to replace your 95 installation completely, you'll have to remove it manually (DELTREE or FORMAT...) before installing. Quite frankly, though, unless you're really strapped for disk space, you're best off going with the dual-boot. NT is nice, but it's not nearly so fun to play with. You'll be surprised how quickly you start to miss Plug and Play, and decent hardware support, as well as the occasional crash to make life interesting.

Taking the bus

I saw an interesting network setup in an office the other day in which all of the five PCs (all running Win NT) were connected on a common 10/100BaseT coax bus with no network hub to be seen.

Apparently, they were connected based on the use of intranet addresses and this allowed access to the printers (connected directly to two of the machines rather than on a separate printer server) as well as to a common ISDN modem for internet email access for all the users in that office. How is such a system set up? Is this method faster/better than using a more conventional network configuration with a hub? Are there advantages and disadvantages? (Andrew Woodfield, by email)

Ok, what you're dealing with here is a bus wired network, instead of the more common star topology. The only differences between the two types of network are at the physical



layer — the software is the same. Instead of each computer being attached to a central hub (which usually only amounts to a bit of fancy cross-wiring and some signal regeneration), each computer on a bus taps into a single common cable, using BNC T-connectors. This can be easier to set up in some situations, but I really wouldn't recommend it, for a number of reasons.

Firstly, the network cable has to join straight onto the network cards themselves — making for a rather messy physical setup, and moving computers around afterwards can be extremely difficult to say the least. Secondly, the technology is electrically picky — the cable needs to be correctly terminated, and earthed at only one end. Also, the topology is inherently fragile — one cable break or bad connection will take down the whole network, instead of just the affected computer. This makes troubleshooting rather difficult, as you can imagine.

It's true you do save the \$60 or so that a hub would set you back, but you really have to ask yourself if it's really worth the hassle of dealing with coax and BNC connectors, which aren't fun at the best of times. 10BaseT is a lot more forgiving, easier to lay out, and awful lot easier to expand later.

As for the software setup you describe, it sounds like a fairly standard TCP/IP network. The 'intranet addresses' you describe simply means that they used one of the private, non-routable address spaces, such as 192.168.0.0, instead of using 'real' IPs, which would require purchasing a range of

static IPs from their internet provider.

The computer with the ISDN adaptor is undoubtedly using a NAT program, such as the never-sufficiently-to-be-praised Sygate (US\$40 at www.sygate.com) to route packets from the LAN over the internet. The shared printers are straightforward, too. Both NT and 95 can act as print servers without any special configuration at all, you simply share the printers on the computers concerned, and all the computers on

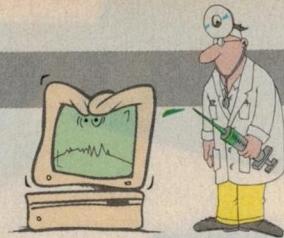
the workgroup or domain are able to print to them as though they were directly connected.

Hidden messages

While I have been able to read my CDROM when starting with DOS, by putting the necessary lines in AUTOEXEC.BAT and CONFIG.SYS, I have not been able to make a floppy boot disc that will read the CDROM. That is, not until September's Webwatch column told me about www.bootdisk.com (What a GREAT site!!) Now my boot floppy loads nicely and I can access the CDROM from the A:> prompt.

However as the floppy loads, I still get the 'Starting Windows 95' message. Why is this? Where is this message coming from? What would happen if I reformatted C: and then booted the floppy? (John Kilkenny, via email) The 'Starting Windows 95...' message is printed by IO.SYS, one of the system startup files on the root of the floppy. The thing really has no idea whether or not you have 95 on your computer, it's just a trendy 90s replacement for 'Starting MS-DOS...', especially as Microsoft are trying to distance themselves from their monstrous creation...

If you're feeling bored some day, load up your favourite hex editor (I rather like Fed, a small DOS hex editor, available from [ftp://ftp.simtel.net/pub/simtelnet/msdos/binaries/fed16.5.zip](http://ftp.simtel.net/pub/simtelnet/msdos/binaries/fed16.5.zip)) and edit the strings embedded in the file to something a bit more fun, such as 'Loading linux....', or 'Welcome to Macintosh!'. You'll need to make the file visible first, by typing ATTRIB -R -H -S A:\IO.SYS, and hide it again



Got any computer queries? Whatever is bugging you, from hardware problems to C programming, send it in and we'll soon have you fixed up. You can email your question to electaus@fpc.com.au, or fax or mail it in to us here at EA.

```

File Edit
Auto [ ] [ ] [ ] [ ] A
0123456789ABCDEP 56 00 01 02 03 04 05 06 07 08 09 0A 0B 0C 0D 0E 0F
10020 70 11 0B 12 54 68 69 73 20 76 65 72 23 69 6F 6E
10030 20 6F 66 20 57 69 6E 64 6F 77 23 20 22 65 71 75
10040 69 72 65 73 20 61 20 33 38 36 20 6F 72 20 62 65
10050 24 74 65 72 20 70 72 6F 63 65 73 23 6F 72 2E 0D
10060 00 24 00 00 00 41 32 30 20 68 61 72 64 77 61 72
10070 65 20 65 72 72 6F 72 2E 20 20 43 6F 6E 74 61 63
10080 74 28 74 65 63 68 6E 69 63 64 6C 20 73 75 70 70
10090 6F 72 74 20 24 6F 20 69 64 65 6E 74 69 66 79 20
100A0 24 68 65 20 20 70 72 6F 62 6C 65 6D 2E 0D 00 24 00
100B0 53 24 61 72 24 69 6E 67 20 57 69 6E 64 6F 77 73
100C0 20 39 03 2E 2E 2E 0D 00 00 04 24 00 52 69 6E 64
100D0 6F 77 73 20 39 38 20 69 73 20 6E 6F 72 20 23 24
100E0 61 72 74 69 6E 67 20 29 6F 75 22 20 4D 53 20 44
100F0 4F 53 2D 62 61 73 65 64 20 70 22 6F 67 72 61 6D
10100 2E 0D 00 00 04 24 00 57 69 6E 64 6F 77 73 20 39
10110 38 20 69 73 20 6E 6F 77 20 72 65 73 74 61 72 74

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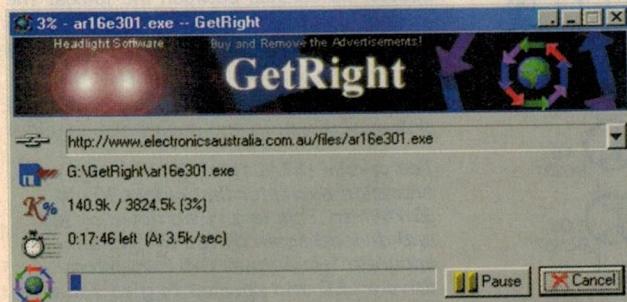
with ATTRIB +R +H +S A:\IO.SYS afterwards. Make sure you don't change the length of the file, or overwrite the control characters between messages, or you'll make the disk unbootable.

Do **NOT** edit the IO.SYS file on your hard drive unless you know what you're doing and you have a working, unmodified startup disk from which you can SYS C:\ if anything goes wrong.

Get it right!

The internet is absolutely stuffed to the gills with software, all of it yours for just a mouse-click... And a three-hour wait while it downloads. Downloading sucks up your bandwidth, making further surfing a slow and painful process, and requires that you hang around until it's finished so you can disconnect. Most infuriating of all, though, is when your downloads fail, someone picks up the phone, or your computer crashes, and all your hours of waiting go for nothing.

Well, it doesn't have to be that way. There are a number of download managers on the market, but the top of the heap is GetRight. With Getright, you can schedule download jobs to run overnight without supervision, it can connect and disconnect automatically — and if you have an ATX power supply, it can even power down your machine for you.



Apart from its scheduling capabilities, Getright will retry connections if the server is busy, so you can just set it up and it will keep going until it gets you the file. Best of all, however, it supports resuming of incomplete downloads. This means that if your connection dies, next time you log on, you can pick up from where you left off, instead of having to start again from scratch.

This last feature (and the main selling point) does require that the server you're downloading from supports HTTP 1.1, but this is becoming more and more common.

GetRight can monitor clicks in your browser, and automatically grab any downloadable files itself - so you really don't have to think about it at all.

Unfortunately, GetRight is not free, it costs \$20 for shareware registration. However, in an interesting move, they haven't time-limited, crippled or added unbearable nag-screens to the unregistered version; what they've done instead is sold advertising space on the program's interface. Bannerware, in other words. Whenever the program detects an available net connection, it connects to an ad server and downloads an advertising banner, as seen all over the web.

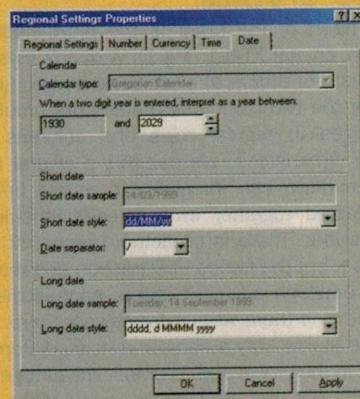
While you can purchase the software and remove the banners, you're indirectly providing them with some income, just by using the unregistered version... Ain't capitalism grand? All in all, GetRight is a class act, it does the job, and it doesn't get in the way. Highly recommended. Grab it now from www.getright.com.

Rollover or play dead

I've come across a useful Y2K tip and I thought you and your readers might be interested. Go to the Regional Settings control, click to the date format, and change the entry in the 'Short date style' box from Win95's default 'd/MM/yy' to 'd/MM/yyyy'. This way, programs get four digits in the system date, and it rolls over properly. (A. Hutchisson, via email)

Nice idea, but I'm sorry to say that it's really not necessary. That setting only affects how programs render the date for display purposes — they'll still use the standard 32-bit internal representation of the date for calculation.

If you want to see for yourself, go into Excel, enter 1/1/99 and 1/1/00 in a couple of cells, then subtract them in a third — you'll come up with exactly 366 days, the right answer. The



rollover works fine in that regard. It's possible that there might be some applications that are brain-dead enough to try and perform calculations on the string version of the date... but I doubt that many people would be affected.

There's been an incredible amount of panic relating to Y2K issues, and getting systems certified — granted, there have been some nasty bugs, (Win3.1 users aren't going to have a fun time...) but in the vast majority of cases, Y2K problems stem not from the software itself, but actual contents of files and databases.

For instance, by default, the system rolls two-digit dates over at 2030 — years entered as two-digit numbers in the range 00-29 are considered to be 2000 to 2029, but years 30-99 are taken to mean 1930-1999. This is a good compromise, but if you go and do something silly like importing 2-digit dates from a text file without taking this arbitrary pivot point into account... Civilisation As We Know It will come to a grinding halt. Or something like that, anyway.

\$10 WONDERS

29

Precision seconds timer

Want a really accurate timer? How about one that times with an accuracy of 0.003%? And it doesn't even need calibrating! How do we do this? With a component that we haven't looked at before: a crystal.

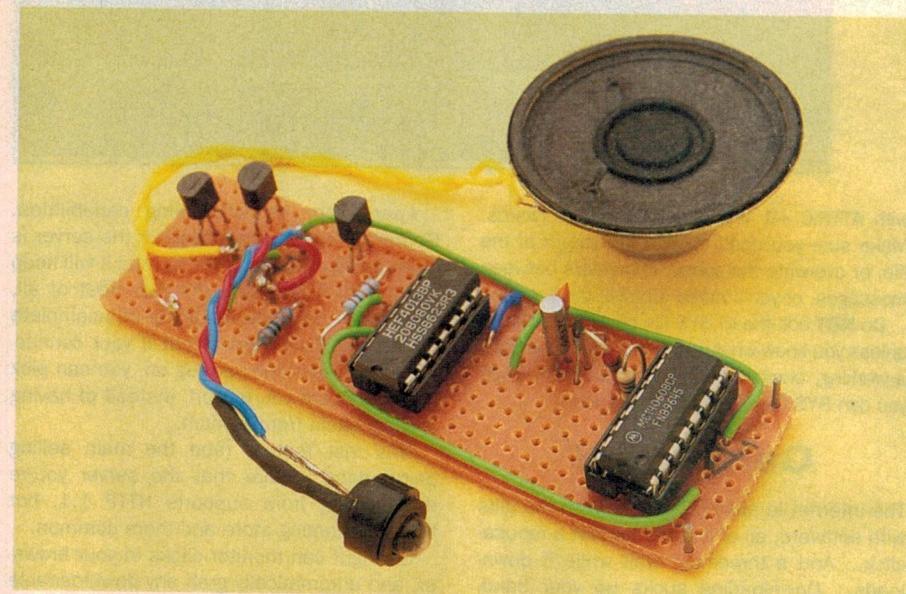
This timer flashes a LED once a second and at the same time emits a sharp beep. Counting the flashes or beeps is an easy way of counting seconds. The circuit is driven by a quartz crystal of the same type as used in a digital watch or clock so it has high precision, but what is a quartz crystal? And how do we make it oscillate? Well I'm glad you asked...

The crystal

The heart of the timer is the piezo-electric quartz crystal XTAL1 (Fig.1). A quartz crystal consists of atoms of silicon and oxygen (just about the two commonest elements around) arranged in regular rows and columns in three dimensions. We call this a crystal lattice and we can imagine the atoms being connected together in a three-dimensional framework. There is no actual framework, of course, but the forces of attraction and repulsion between adjacent atoms causes them to act as if there were a framework there.

The atoms stay a somewhat fixed distance apart in their rows and columns, linked together by forces that produce the same effect as a framework made of fairly stiff springs. In other words, it is not a framework made of rigid rods like the steel framework of an office block, but rather more a springy framework - much like a three-dimensional trampoline.

The forces between the atoms are electrical, with some attempting to pull the atoms



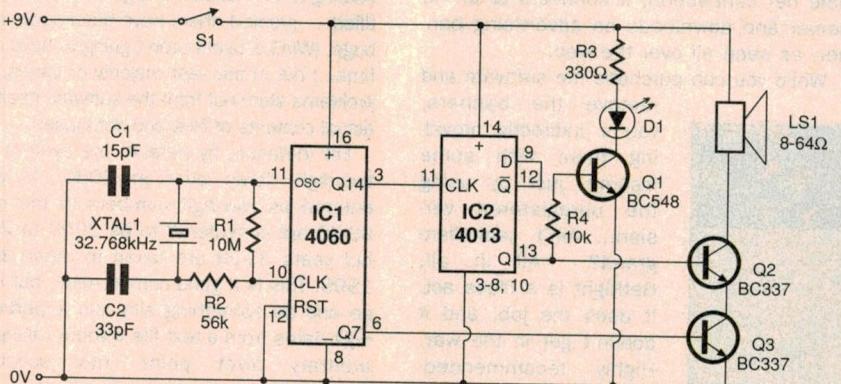
closer together and others trying to force them apart. When the crystal is at rest these forces balance out nicely, and the crystal takes up its 'natural' size and shape. When we squash the crystal slightly by applying mechanical force to it, some of the atoms are pushed closer together. This unbalances the forces and the result is that a potential difference (or voltage) develops between opposite surfaces of the crystal.

If these surfaces have electrical connections made to them, we can detect a voltage across the two sides of the crystal. This voltage increases as the pressure (and thus the distortion of the crystal) increases.

A good example of this effect is a crystal microphone, in which the crystal is distorted by the pressure of sound waves. The voltage across the crystal is an electrical signal that can be amplified and is an analogue of the original sound wave.

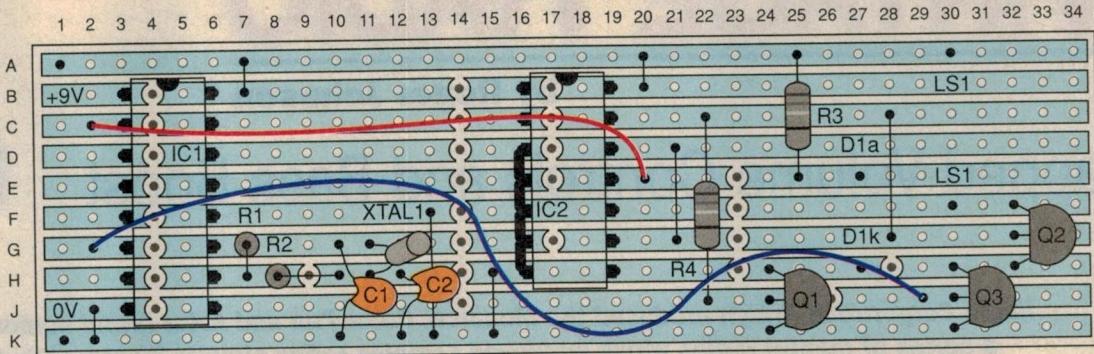
An interesting observation is that the reverse action also occurs. If a voltage is applied to opposite surfaces of the crystal, this upsets the balance between the forces. The distances between the atoms change until the forces balance again and thus the crystal alters its shape, becoming thicker or thinner.

In Fig.1 the crystal is part of a circuit consisting of resistors and capacitors, together



The crystal (XTAL1) is part of a high precision oscillator that clocks IC1 at 32.768kHz. This is divided down by IC1, and divided again by IC2 to give an accurate 1Hz output. The transistors drive a LED and speaker to give you a visual and audible output.

When cutting the tracks, don't forget the break at J26, partly hidden by Q1 in this diagram. If you have difficulty in finding a suitable crystal, you might be able to salvage one out of an old digital watch.



with an inverter (which is inside the IC between pins 10 and 11), which creates an oscillator. When the voltage across the capacitors increases, energy is stored in the capacitors in the form of electric charge.

As the crystal is part of the oscillating circuit, the voltage across the crystal also alternates. As the voltage across the crystal increases, energy is stored in the crystal in the form of mechanical energy that puts its 'springy' lattice under stress. As the voltage across the crystal decreases, the crystal recovers its normal shape, producing electrical energy, which is stored in the capacitors.

As the crystal is physically cut to mechanically resonate at a particular frequency, the circuit will only oscillate at that frequency. It is like a person jumping up and down on a trampoline keeping time with the natural frequency of the trampoline. The closer the person keeps time with the trampoline, the higher they bounce.

The capacitors and the crystal both store energy, and are both capable of oscillating in a circuit. But there is a difference between them: the capacitors are able to oscillate at a fairly wide range of frequencies — we can make an oscillator using only resistors and capacitors, but it is not very stable. By contrast, the crystal oscillates very strongly at one particular frequency known as its resonant frequency, but it does not oscillate at frequencies a little lower or higher than this. This is why a crystal clock is very precise.

Another disadvantage of capacitors is that it is not easy to manufacture them to have exactly the required capacitance. But crystals can easily be made to have an exact resonant frequency. For example, the frequency of a watch crystal is 32768Hz. It is accurate to 1 part in 32768, or 0.003%. Capacitors are never that accurate, so a quartz crystal oscillator is both precise (keeps closely to one particular frequency) and accurate (the frequency is exact to 0.003%).

A frequency of 32768Hz has a period of about 30us, which is far too short for us to be able to count the oscillations, so we divide the frequency in a 14-stage binary divider which is the main function of IC1. Halving the

frequency 14 times results in a frequency of 2Hz (Try it! $32768/2 = 16384\text{Hz}$, then $16384/2 = 8192\text{Hz}$... and so on for 14 divisions.). Two pulses a second (2Hz) is countable by humans, but we use a flip-flop (IC2) to divide by two just once again, giving a final output (at pin 13 of IC2) of 1Hz, or one pulse per second. It is on for exactly the same length of time as it is off, and so the transistor is turned on for exactly half a second, and off for exactly half a second.

The pulse is also fed to Q2, turning this on once a second. Q2 and Q3 are rather an unusual arrangement of transistors. In practice they are a pair of transistor switches connected in series. Current can flow through both transistors only when both are switched on. As a result, Q2 is switched on for half a second every second (same as the LED), which lets Q3 turn on, producing a tone in the speaker from the 256Hz output from output Q7 of IC1.

Construction

The circuit is quickly assembled on a small rectangle of stripboard (Fig.2). A wide range of suitable boxes is available to hold it. First assemble the circuit associated with IC1. This comprises IC1, R1, R2, C1, C2 and XTAL1. The layout of the oscillator circuit (to the right of IC1) is compact so as to keep all leads and connections as short as possible.

Note that the copper strip is cut at H9. When IC1 has been assembled, apply power (9V DC) to the circuit and use a meter to monitor the output at pin 3. This should alternate between OV and 9V twice a second. If this final stage is giving a correct output we can assume that earlier stages are functioning correctly too. If not, check carefully with a magnifier see that all strips beneath the IC have been completely cut.

Now add IC2 to the circuit, connecting its input at pin 11 to the output of IC1 at pin 3. Note that a solder blob beneath the board connects pins 3 to 7 of IC2. This is because IC2 contains two flip-flops but we are using only one of them. The solder blob connects all unused inputs to the OV line. Note that the strips are NOT cut at F17 and H17. Testing

should show a 1Hz signal from IC2, pin 13.

Finally add the three transistors and associated wiring. The LED can be mounted directly on the board by soldering it in at E27 and H27. Or mount it on the lid of the box, and connect its leads to terminal pins at those two points. The power switch SW1 is also mounted on the box. This can be almost any type of single-pole single-throw switch, but probably the most suitable type is a push-switch with push-on/push-off action.

If the speaker is a miniature one, mount it on the box, first drilling an array of holes to let the sound out. It can be held in place by applying contact adhesive to its rim and, when the adhesive is dry, pressing it firmly against the inside of the box. The circuit is intended to operate on 9V, though it will also operate on 6V or 12V. A PP3 battery is suitable for a 9V supply. Use a battery clip to connect it to the circuit. ♦

Parts List

Resistors

(All 5%, 0.25W)
R1 10M
R2 56k
R3 330 ohms
R4 10k

Capacitors

C1 15pF ceramic
C2 33pF ceramic

Semiconductors

D1 LED, 5mm superbright
IC1 4060 14-stage binary counter/divider
IC2 4013 dual D-type flip-flop
Q1 BC548 NPN transistor
Q2, Q3 BC337 PNP transistors

Miscellaneous

XTAL1 32.768kHz quartz crystal
LS1 Miniature 8Ω speaker
SW1 SPST switch
Stripboard 28 x 88mm (10 strips x 34 holes); 6 x 1mm terminal pins; 14-pin IC socket; 16-pin IC socket; 9V battery clip.

VINTAGE RADIO

by Roger Johnson



Tapped Volume Controls and Bass Boost

Radio Corporation, which produced the Monarch, Peter Pan and Astor brand names, released a series of mantel radios which employed complex reflex circuits incorporating tapped volume controls for bass boost. They weren't the only manufacturer to do so, of course; Philips and HMV did as well. This month we're looking at what these circuits were designed to do, how they work, and what can be done when they fail...

AS I'VE MENTIONED here before, in the years from the end of WW2 to about 1950, Australians were hungry for anything and everything that was new. Radios were no exception. As a result of technological progress due to WWII, radio manufacturers had developed new and efficient coils, better magnets and injection moulding, all of which were incorporated into post war design. Quite compact mantel sets were produced, which were very complicated when compared to their pre-war counterparts.

The small cabinets, together with other features such as very small output transformers and 5" speakers, all lifted the 'roll off' (sometimes called 'bass cut-off') frequency higher and higher. It should be noted that a frequency of merely 130Hz or thereabouts is 'Tenor C' (or C below middle C) and 260Hz is middle C.

In short, then, the bass frequencies were becoming quieter and quieter, to the extent that just about any sound in the bass registers resulted in a soft 'boomf'. It was up to our sub-conscious musical interpretation to

reconstruct those faint bass notes. However, there is a limited solution to this problem, which was overcome by a degree of bass lift or boost, incorporated into the electrical design. This is where tapped volume controls enter the scene: to enable engineers to design bass boost circuits that overcame the limitations described above.

There are however limiting factors. The bass boost can't be excessive, because in those small sets with 5" speakers, too much boost will cause distortion. Bass boost should give a reduction in harmonic distortion, but this condition only holds over a limited frequency range. Another limiting factor was the cheap output transformers, which had a low inductance such that the output valve can only provide a small fraction of its mid-frequency undistorted output, before distortion becomes serious at frequencies below 100Hz.

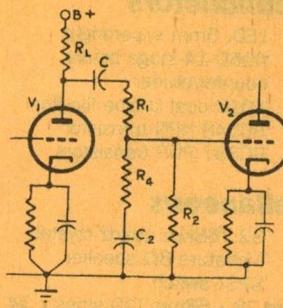
Bass boost is by no means simple, and there are many many inter-related factors. For example, it has been determined that a receiver with 4W maximum undistorted output

and a bass boost of merely 12dB at some frequency below 100Hz, (which we will call F(bst)) will be easily overloaded at the bass boost frequency. In fact given these constants, and assuming that F(bst) is 100Hz, and also that the power output at low frequencies is the same as mid frequencies (which it is invariably not), then an input which will give a tiny 300mW output at mid-range will cause overload at F(bst)! Notice that feedback has not even been mentioned yet.

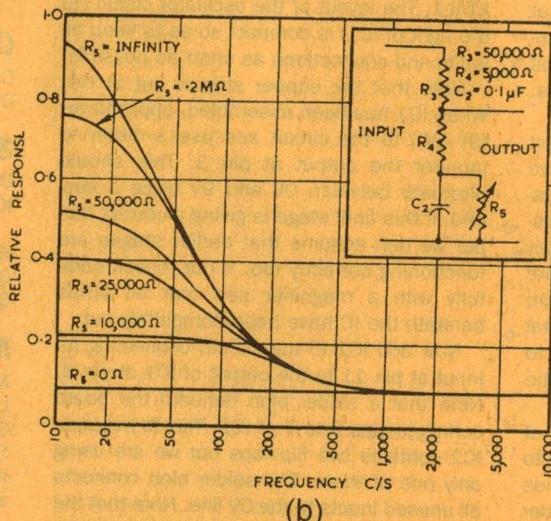
If the bass boost frequency is set too high, say at 150Hz, reproduction becomes boomy and unpleasant to listen to. Even worse is excessive gain at frequencies lower than the bass resonant frequency of the loudspeaker. In this instance, the fundamentals cannot be reproduced at all, and any output is due to mainly the second harmonic.

The trick therefore was to introduce carefully designed bass boost at low listening levels, and then to have the radio assume 'normal' frequency response as the listening level is increased. But how was this achieved?

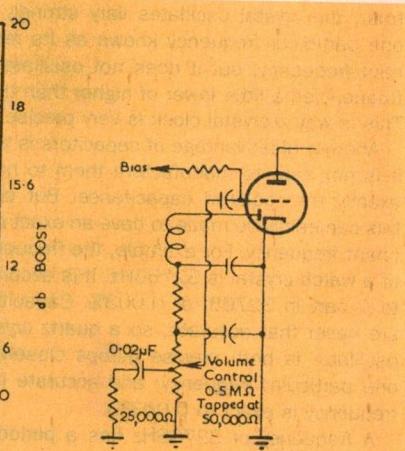
Fig.1: Three diagrams, taken from the fourth edition of Langford-Smith's 'Radiotron Designers Handbook', showing how bass boost circuits operate in principle.



(a)



(b)



(c)

Tone compensation

In order to understand this we must look at the various forms of tone compensation. Most people are familiar with the simple treble attenuation tone control fitted to most receivers, consisting of a $47nF$ or $0.1\mu F$ capacitor in series with a $50k\Omega$ pot, connected from the anode of the output valve to earth. The potentiometer is there to control the amount of treble cut to suit the listener. In other words, the higher frequencies which are dependant upon the R/C combination, are bypassed to earth to a greater or lesser degree.

Bass boost, on the other hand, is greater relative amplification of the lower frequencies, generally taken to be below $1kHz$, and expressed in dB per octave. Needless to say bass boost can be achieved with or without negative feedback, which is a full subject in its own right.

The theory of bass boost is quite simple. By a combination of resistance and capacitance as shown in Fig.1(a), we produce what is a variable voltage divider, for different audio frequencies. At middle and higher frequencies, capacitor C2 has a relatively low impedance (reactance), and the audio signal fed from the plate of V1 to the grid of V2 will be attenuated by the divider formed by R1 in the upper leg, and R4 in parallel with grid resistor R2 in the lower leg. However at low frequencies, the impedance of C2 rises and gradually removes R4 from the divider — leaving only R1 and R2, which together provide much less attenuation. This gives a higher output, so the lower frequencies are effectively boosted.

When incorporated into a receiver circuit, there are two methods; plate shunt boost and grid shunt boost. Plate boost is important for limited bass boost at lower listening levels, and where and why we have a tapped potentiometer. If we look at the R1/R4/C2 part of Fig.1(a), and place across C2 a $0.5M\Omega$ pot (R5), the amount of boost can be adjusted

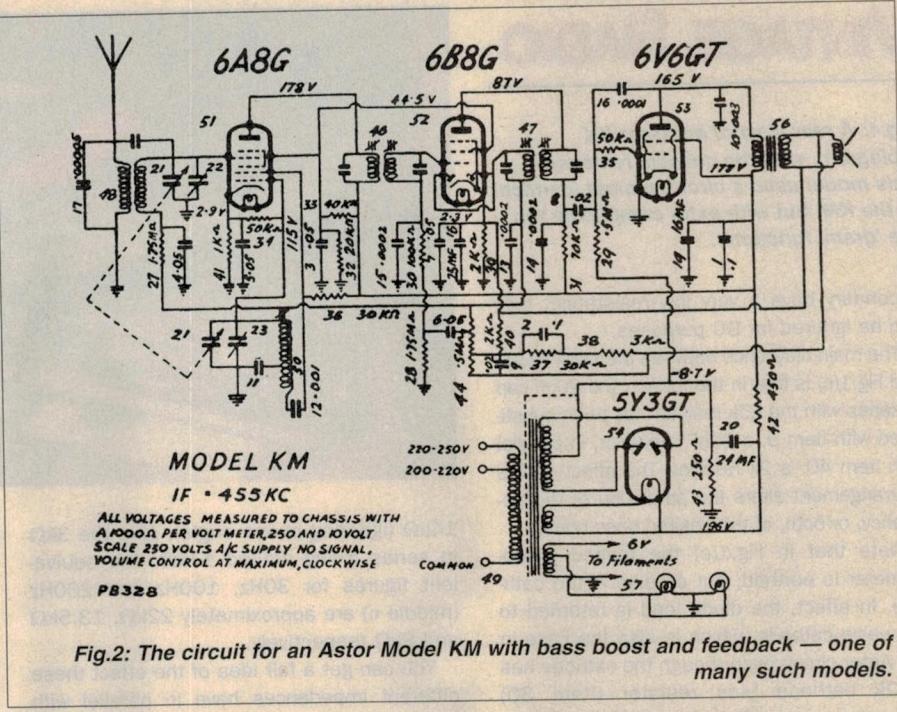


Fig.2: The circuit for an Astor Model KM with bass boost and feedback — one of many such models.

according to the setting. Fig.1(b) shows the relative response for different settings of R5.

Now if this $0.5M\Omega$ pot just happened to be part of the volume control, we can now see the beginnings of variable bass boost at low listening levels.

Limited bass boost

Fig.1(c) shows how this kind of circuit was added to a conventional receiver volume control, at the output of a diode detector, using a tapped potentiometer for the volume control. As you can see a series capacitor and resistor of carefully chosen value were connected to ground from a predetermined 'tap' on R5, and this caused bass boost to be introduced when the wiper was turned down toward the earthy end of the pot — i.e., for low volume levels.

This was in fact how the bass boost feature

was provided in many of the commercial radios, especially Astor models. The $0.02\mu F$ ($20nF$) capacitor is essentially C2 of Fig.1(a), while the $25k$ series resistor is R4. At maximum volume, i.e., when the wiper of the volume control is toward the top, the boost is minimal. But as the wiper moves down and approaches the tapping, boost is at a maximum, and is still high as the wiper passes the tapping.

However, in moving down towards earth (or cathode) potential, the slider is also causing greater attenuation of all signals, including the bass frequencies. This automatically achieves the desired aim of preventing the bass boost from causing the rest of the audio circuit to overload.

Fig.2 is the audio end of many a small 'Astor' 3/4 receiver. The particular one chosen is the model KM — the famous 'Mickey'. (The KK is the radiogram version, which apart from the gramophone mechanism and the radio/gram switch, used virtually the same circuit.) But how does the volume control and bass boosting part of this circuit resemble anything like the circuit of Fig.1(c)?

Well, let's re-draw the circuit, leaving out component numbers (2), (37) and (38) along the way, as these don't play a part at this stage — although their importance can't be overlooked, as we'll see shortly.

Fig.3(a) shows the re-drawn bass boost circuit of the KM. Hopefully you can see how the basic circuit now resembles Fig.1(c), especially when you realise that because the speaker voice coil and output transformer

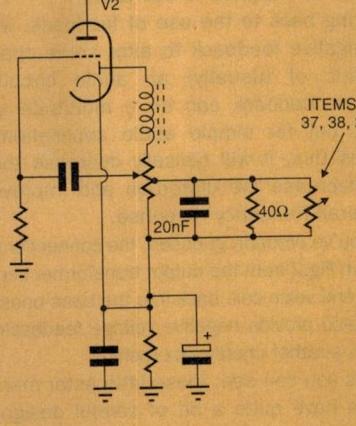
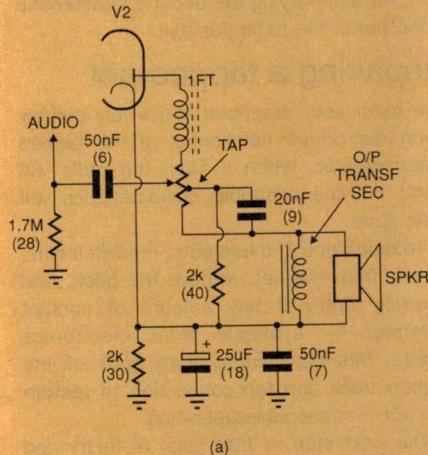


Fig.3: The bass boost sections of Fig.2, redrawn to help explain the function of the various components.

VINTAGE RADIO

Fig.4: A rear view of an Astor KK tablegram, with the chassis removed. This model used a circuit almost identical to the KM, but with extra complexity for the 'gram' functions.

secondary have a very low resistance, they can be ignored for DC purposes.

The main difference between the Astor circuit and Fig.1(c) is that in the former, the 20nF cap in series with the 25k resistor has been substituted with item 9, a 20nF capacitor, in parallel with item 40, a 2k resistor. The effect of this rearrangement alters the amplitude or the frequency, or both, of the desired bass boost.

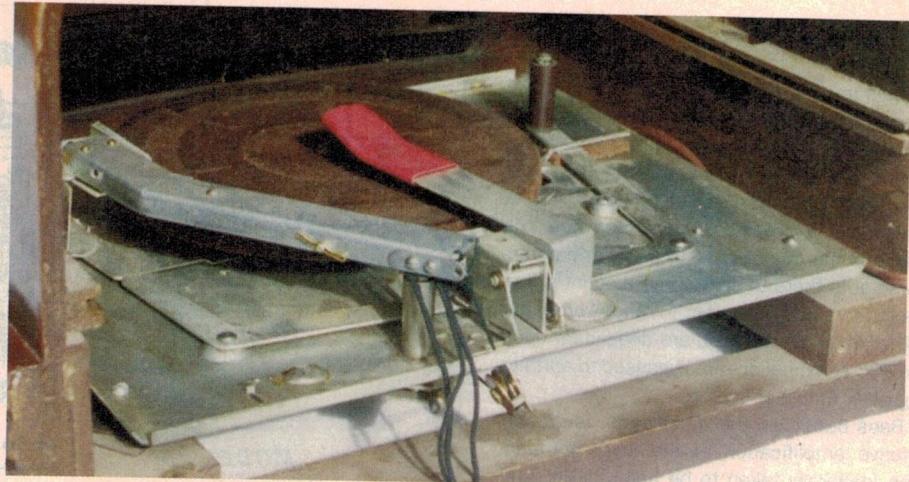
Note that in Fig.1(c) the tapped potentiometer is earthed, but so also is the cathode. In effect, the diode load is returned to the valve cathode, which is also the case in the Astor circuit even though the cathode has a 2k cathode bias resistor (item 30) bypassed by the 25uF and 25nF capacitors.

Varying boost frequency

Now let's redraw the circuit in Fig.1(b), this time as Fig.3(b). In place of the variable resistance across the capacitor designated C2 are components (2), (37) and (38), from the Astor circuit. Now this is where the components (2), (37) and (38) can be seen to play their vital role.

Component (9), the 20nF capacitor, is the equivalent of C2 in Fig.1(b) and is shunted by component (2), a 0.1uF capacitor in shunt with 30k resistor (37) and in series with item 38, a 3k resistor.

Now at 60Hz, the reactance of the 0.1uF capacitor is 26.5k Ω . This is in parallel with the 30k resistor, giving a total impedance of



14k Ω (ignoring phase angle), plus the 3k Ω in series giving around 17k Ω . The equivalent figures for 30Hz, 100Hz and 260Hz (middle c) are approximately 22k Ω , 13.5k Ω and 8k Ω respectively.

You can get a fair idea of the effect these different impedances have in parallel with the 20nF capacitor (item 9) from the curves in Fig.1(b). Clearly the higher the frequency, the lower the effective shunt impedance across the boost capacitor, and the lower the bass boost that will occur.

We must remember that all this is achieved using no physical 'tone control'. The tone control is actually there; it's just that there isn't a separate manual control on the cabinet!

Feedback as well

As you may have already realised, the Astor KM goes one step further again. For example component 16, the 100pF capacitor connected from the 6V6-GT plate back to the grid is a form of negative feedback and provides a small degree of treble attenuation. This is mainly to ensure stability at high audio frequencies.

Many sets used a small capacitor from the output valve plate to ground to achieve the same purpose. This could have been omitted in the Astor circuit, but as you can see a modest 3nF capacitor is still used.

Getting back to the use of feedback, we use negative feedback to alter some characteristic of (usually) an audio circuit. Negative feedback can do a multitude of things, but for simple audio applications such as this, it will typically decrease the gain, decrease the distortion and improve the overall frequency response.

As you've probably guessed, the connections shown in Fig.2 from the output transformer secondary and voice coil, back into the bass boost circuit also provide negative voltage feedback, albeit in a rather unorthodox fashion.

So as you can see, those little Astor mantel sets have quite a bit of careful design. Perhaps that is why they were sold in such numbers and so many have endured today. Quite apart from the more desirable cabinet

designs, even those with somewhat bland cabinets are sought after by collectors because they work so well.

You may have noticed already from Fig.2 that just to complicate things, the Astor engineers made them a reflex set as well. The model KK radiogram shown in Fig.4 is even more complicated, and a fair little 'bottler'. A mercury switch is tilted via a string, pulley and spring setup when the record is inserted and the door is closed, which then applies the voltage to the gramophone motor. A mechanical guide automatically selects 10" or 12" records (78rpm only) and the pickup arm is automatically swung across to engage the record. A switch in the front, visible when the door is down, selects either the 'radio' or 'gram' function, and in the 'gram' position connects a crystal pickup directly across the volume control.

The audio reflexing is used for both radio and gramophone modes, to increase the gain. With a good crystal pick-up, these devices give quite a reasonable account of themselves — for what was never pretended to be anything other than a utilitarian, budget-priced radiogram!

Just to make things a little more complicated in the KM, one of the bass boost components is switched out in the 'gram' position, thereby varying the boost characteristic from that in the radio position.

Repairing a tapped pot

The Astor sets described above rely entirely upon the proper functioning of the tapped potentiometer. When it fails, the radio will work, but the desirable characteristics will have gone.

To repair one of these pots, remove it completely from the set, remove the back, and carefully spray a tiny amount of contact cleanser — available from electronics stores. This may clean enough 'gunk' off the carbon track and tap connection to restore the pot to reasonable operation.

The next step, if that fails, is to try and scrounge one from a derelict chassis, give it the same treatment and hope that it works. ♦

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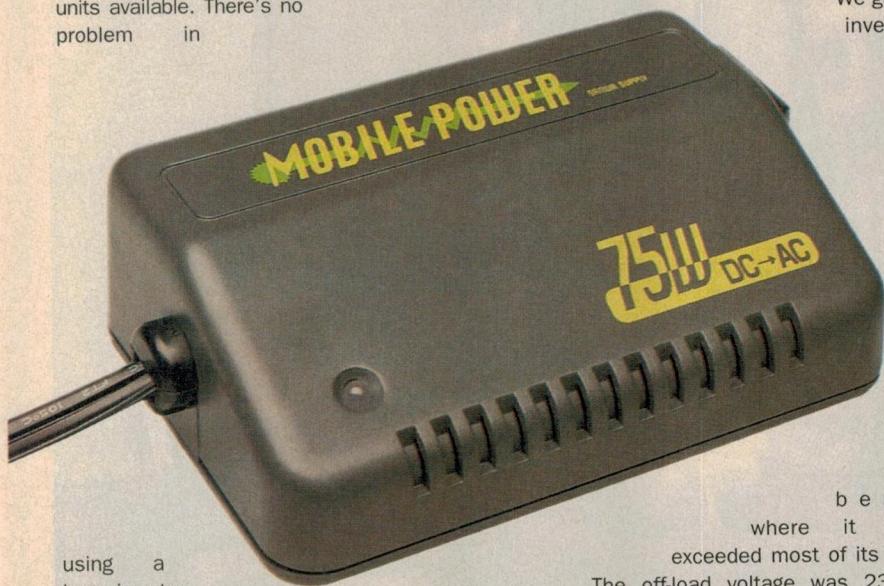
75W compact inverter

by Rob Evans

YOU MAY NOT HAVE NOTICED that amongst the large number of 12V to 240VAC inverters on the market, there's very few compact, inexpensive low power units available. There's no problem in

in those tents, you know! Plus it's small, light (around 300g) and uses a standard 12V lighter plug, so it's very much a candidate for throwing in a corner of a vehicle's glovebox.

We gave the inverter a work-out on the test



using a large inverter to run a low powered mains appliance of course, but the logic goes, why pay for a bigger unit when all you need is one capable of a few tens of watts...

In a package so compact that it fits in the palm of your hand, this neat little stepped-sinewave 75 watt inverter fills that niche quite nicely, and has an asking price of just \$79.95. That makes it about the most inexpensive 12VDC to 240VAC inverter around, so you'd be forgiven that the performance and features would directly reflect the low price.

This is not the case at all, it seems. A baby inverter it may be, but it has an impressive surge capacity of 150W, a rated efficiency of 90%, shut down circuitry for both over- and under-voltage conditions at the DC input, plus thermal and power overload protection at its output.

The power rating, features and price would make this little unit a logical choice for campers and holiday makers, where the 240VAC power jobs that crop up mostly involve small appliances such as phone and camera battery chargers, TVs and VCRs, and even electric blankets — it can get really cold

bench, where it happily exceeded most of its ratings.

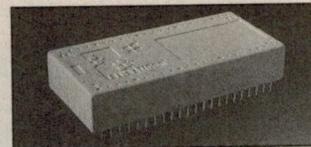
The off-load voltage was 231VRMS and only dropped to 220VRMS when driving a 120W load, while the efficiency figure came in at 92% for loads under 80W and dropped to 88% during the 120W test. The unit itself only became warm after extended use above its nominal 75W rating, by the way, which is a testament to the circuit's efficiency.

As far as user feedback goes, the inverter offers just one LED, but nonetheless, makes good use of it. This is a two colour device that simply shows green when all is well (no overloads, input voltage within the required 10-15V range), and red when the circuit is nearing a shut down condition. Plus of course, when the LED is off the unit has completely shut down due to an overload or a lack of input voltage — that is, you've unplugged it...

With the level of features and performance offered by this inverter at an asking price of only \$79.95 it would be an ideal choice for travellers and campers alike, where low power mains appliances need to be run from a 12V source. The unit is available from Jaycar stores throughout Australia; for further information, see the Jaycar catalogue or check their website at www.jaycar.com.au. ♦

THE TIGER COMES TO AUSTRALIA

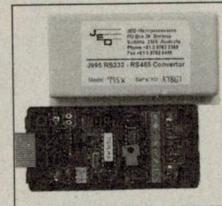
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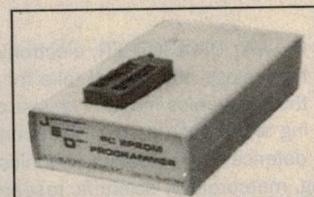
The small plastic case 100mm by 55mm by 25mm is an Australian-built RS232 to RS485 optoisolated converter. It connects a PC or PLC RS232 serial port to a multidrop RS485 differential cable up to 4,000 ft long.

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Taking it Further: Courses in Electronics



Electronics makes a fascinating hobby, and it can also make a challenging and satisfying career. Either way, the rewards tend to be greater when you expand and deepen your knowledge by taking one of the many courses available at colleges, universities and institutes around Australia. Here's a sampling of just some of the courses you can choose from...

ONE WAY OR ANOTHER, electronics underpins much of the 'high technology' that we all take for granted nowadays. As a result the electronics industry is vast and highly distributed — including areas such as microelectronics, satellites, telecommunications, defence, broadcasting, avionics, computers, biomedical engineering, meteorology, scientific research and teaching organisations.

Not surprisingly, there are a huge number of options open to you when it comes to tertiary education in the electronics field. You don't need to be a rocket scientist to get started, either. Simply completing year 12 will often be enough to get you through the door in most places, and just about all of the institutions are quite generous in giving credit or advanced standing. So if you have done any prior study or had experience in the industry, you may well be off to a flying start.

But where do you start? Well, we made a few enquiries and had quite a few responses from universities, colleges and institutes

around Australia — all offering a wide range of subjects on a number of different levels. We'll start off with one of the biggest, most flexible and perhaps most familiar tertiary institutions in the country: TAFE (Technical and Further Education).

TAFE courses

TAFE is probably the largest educational institution in Australia, and most colleges offer a range of electronics and electrical based courses. You can expect part-time (i.e., evening) and full time subjects to take you from year 12 through to a full diploma in electrical engineering or electrical technology, with specialisation in various fields including power engineering, computing and information technology, microelectronics, electrical control and communications.

TAFE also plays a vital role in industry apprenticeship and trainee schemes, and their Trades division is an ideal place to

Left: Mark Arrowsmith of Wishar, with IAP student, Jason Cutting.
On the right is Tony Roe of Goyen, with IAP students Stuart Irwin, and Simon Smith.

start if you are currently working in the industry. You can receive an Electrical Trades Certificate after three years (part time), and this can be upgraded to a Diploma and then to a full Advanced Diploma in the Engineering Division. All subjects on offer are modular, and credit for completed subjects can be easily transferred from college to college, or state to state.

If you can't afford the time, or are located too far away from your nearest TAFE college, you might like to consider OTEN, the Open Training and Education Network. OTEN provides a wide range of open learning, distance education and training programs, and many of the electrical and electronics subjects can be completed with the comprehensive notes and support material supplied. You may have to attend a college from time to time, but if you are unable to get to the college offering the subjects you want frequently, it's well worth considering.

Some of the electronics-related courses currently available from TAFE colleges include Electronics Technology (Certificate I), Electrotechnology Manufacturing (Certificate I, II and III), Electronic Equipment (Certificate II), Electronics - Trade (Certificate III), Electronics (Communications) Trade (Certificate III) and other Electronics Trade variants including Entertainment/Office Equipment, Business Equipment Maintenance, Computer Assembly, Electronics Automotive Accessories and Security System Installation.

SIT

The Sydney Institute of Technology (SIT) is offering electronics courses that meet the newly established qualifications set out in the recently endorsed Training Package for Electrotechnology.

The Institute's Electronics and Electrical Engineering sections are focusing their courses on Computer Systems Engineering, providing education and training in Certificates II, III, IV, Diploma and Advanced Diploma courses in this area. These courses aim to provide students with the knowledge and skills needed to work in roles from computer assemblers to paraprofessional engineers in the electronic control and computer systems fields.

Shorter electronics courses are also available including a 36 hour course in PC Upgrade and Repairs.

The Electronics section also offers a Certificate II Traineeship in Security Systems which is a requirement for becoming a licensed Electronic Security Installer.

The burgeoning Business and Entertainment sectors can also be serviced by Sydney Institute which offers certificates II and III in Audio/Visual Entertainment Systems and Business Equipment Servicing. A Certificate IV in TV and VCR Servicing is also offered.

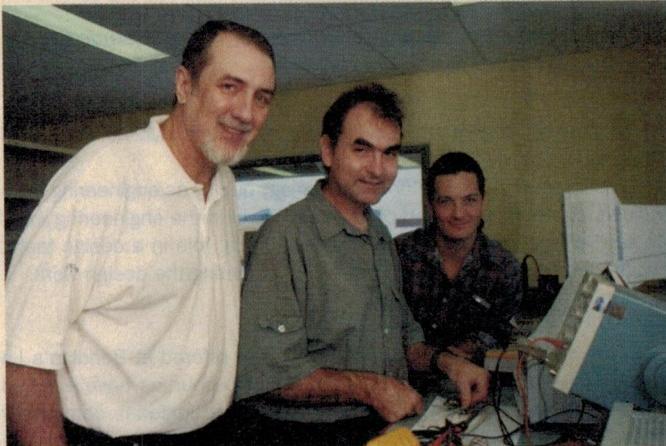
A short course in Compact Disc Servicing is also available for those wishing to update their trades skills.

Deakin University

If you have a higher school certificate and already work in some facet of the industry and want to improve your qualifications, it's worth considering an engineering degree in electronics through Deakin University in Victoria. You can also take a degree in related fields such as robotics, computronics, and mechatronics. Deakin's engineering degrees are said to be particularly attractive to people in industry because you can study off-campus, part-time or full-time, using flexible course delivery — allowing you to 'go to university' without attending classes.

While about 50% of students in Deakin's School of Engineering and Technology are school leavers, the other half are mature-age people who usually study part-time from home or work.

Deakin has strong links with industry, and in August was named Australian University of the Year for 1999-2000, for the development of outstanding partnerships in education and training (Deakin was



joint winner with the University of Wollongong). This is the first time in the history of the prestigious award that a university has won the title twice. Deakin was named University of the Year in 1995 for its innovative use of technology in undergraduate education.

Deakin's undergraduate degrees in engineering and technology are designed to promote articulation from TAFE-based engineering courses, and to offer the chance to upgrade for mature-age students already in the workforce. Mature-age students usually enroll because they work in an engineering-related field and want to advance to a professional qualification. Degrees can take less time because Deakin gives maximum credit or advanced standing for relevant prior study and/or industrial experience.

Deakin offers the Bachelor of Engineering degree (equivalent to four years of full-time study) in electronics, robotics, computronics, mechatronics, mechanical, manufacturing, and environmental. The Bachelor

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DEAKIN

Courses in Electronics

Richard Egelstaff of Lucent Technologies, with IAP students, Bruce Lee (sitting) and Adam Hughes.

of Technology degree (three years equivalent) is available in all of these areas as well.

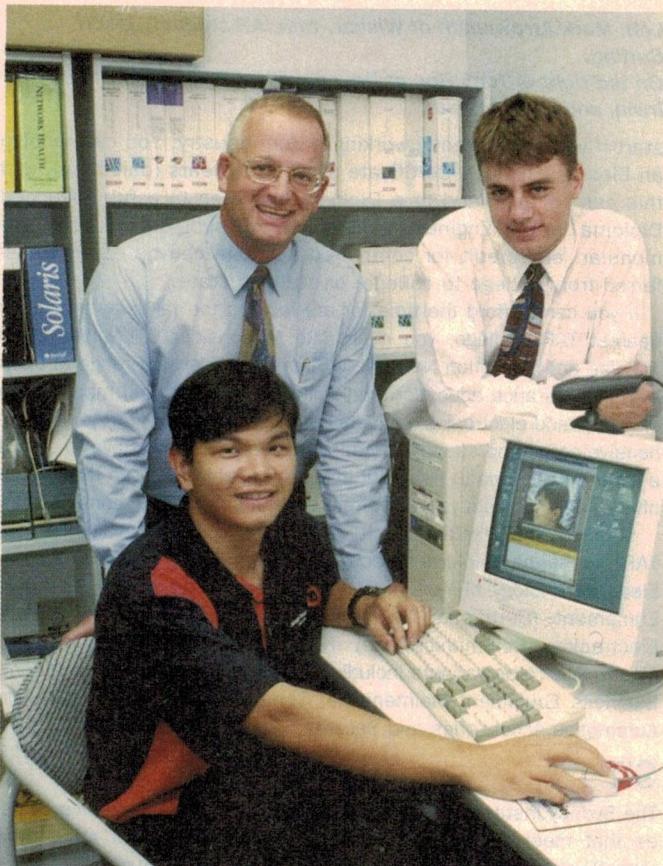
Graduates of the Bachelor of Technology qualify as engineering technologists, a fully accredited professional level in the engineering workforce. Generally the engineer plays the leading role in a design team, while the technologist is involved in implementing the design work.

La Trobe University

Engineering and Science courses have been offered at Bendigo's La Trobe University for over 125 years. Bendigo courses have a proud history of interaction with industry and the regional community through consulting, research and training programs. One of the University's primary aims is to provide a wide range of tertiary educational opportunities for the people of northern and central Victoria.

The global information technology and telecommunications skills shortage has recently been identified by both Federal and State Governments as a major concern. To meet this need for specialist technical training, La Trobe University is introducing a new Internet Telecommunications Engineering degree, commencing next year. The course was developed with the assistance of communications industry representatives and complements existing Bendigo Faculty strengths in information technology, e-commerce, business and geographic information systems.

Another new course being offered by La Trobe Uni is a Bachelor of Computing/Bachelor of Visual Arts, which will combine existing courses offered by the schools of Management, Technology and Environment, and Arts and Education at the Bendigo Faculty. The new course aims to increase the educational opportunities for high achieving students, and



INDUSTRIAL AFFILIATES PROGRAM GRIFFITH UNIVERSITY - TAP INTO OUR RESOURCES



Join the 150 companies who have benefited from the Industrial Affiliates Program over the past seven years.

Experience the benefits to your company of having final year engineering students develop award-winning projects:

Queensland IT&T Awards

1997 Student Category

- 1st prize: Jeff Smith

- 2nd prize: Steve Howard

1998 Individual Student Category - 1st prize: Melanie Butt

Griffith University students work in your organisation, producing research and design solutions from concept to prototype.

Most importantly, you can provide an opportunity for Australia's young engineers to gain valuable industry experience with associated academic rigor.

What our industry partners say about the program:

"The legacy of one student's time with Australia Post is "a working prototype for a project that is now being trialed in Brisbane with the possibility of being used state-wide." (Graham Tooms, Australia Post)

"The IAP ... provides the industrial partner ... with some real results, at little or no effective costs. IAP is an excellent long-term industry development initiative..." (Tony Roe, Goyen Controls)

"The IAP is an excellent way of preparing the student for the real world. Companies also benefit in that problems can be solved by the IAP student using the latest technology available." (Bruce Kruger, Queensland Television Ltd.)

"IAP has proved to be an excellent source of development resources and has enabled us to undertake projects that otherwise may be deferred - indefinitely! Also access to current skills etc that current (permanent) staff do not/may not possess." (Ray Newman, One Management)

To tap into the resources the Industrial Affiliates Program offers, contact Carol-Joy Patrick on telephone: (07) 3875 5007, fax: (07) 3875 6726 or email: cj.patrick@sct.gu.edu.au

GRIFFITH UNIVERSITY

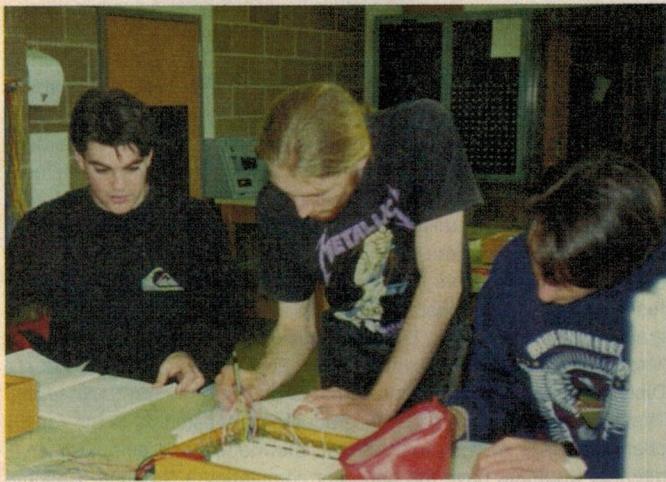
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THE WAY

www.gu.edu.au

GUN94



Jolyon Binks, Gawain Davidson and Craig Pitts get stuck into their digital electronics course at the Mt. Helen campus of Ballarat University.

also provide students with the opportunity to obtain professional qualifications in both Computing and Visual Arts in a single course.

La Trobe Uni also offers various postgraduate courses in Computing at their Bendigo campus. Many of the subjects are available as WWW-based subjects, which means that students do not have to attend in person as much as normal on-campus teaching. These courses include a Graduate Diploma in Advanced Computing, a Graduate Diploma in Computing, Master of Business (Information Systems), Master of Computing and a Graduate Diploma in Advanced Computing.

Uni of Ballarat

The University of Ballarat is a modern and innovative university whose size ensures close contact between staff and students. The higher education campus at Mt Helen, with its friendly community atmosphere, offers a special integrated engineering course that brings together the established disciplines of mechanical/electrical, mining and civil engineering.

The Bachelor of Engineering takes four years of full-time study and from the second year students can choose between three major sequences of study, one of which is automated machine systems (mechanical/electrical engineering). The course has an emphasis on technical and design aspects for modern industrial automation, with a high degree of experiential learning. The university claims its graduates are highly sought after by industry because they have a balanced blend of theoretical knowledge and practical understanding.

Non-VCE applicants may qualify on the grounds of special consideration. Other options exist for mature age students with workplace experience or certain TAFE qualifications. The School of Engineering provides assistance to students through advisory groups and scholarships.

The university's TAFE division offers certificate and diploma courses in electronics, which can be studied full-time over two years or part-time. Two diplomas of electronics are offered, one in computer service while the other is broad based. Both diplomas are geared to meet the needs of students and employers in the industry, by training support staff for professional personnel.

Year 12 students can apply for courses through the Victorian Tertiary Admissions Centre (VTAC), while mature age applicants not currently undertaking a year 12 program can contact Student Recruitment Services. A range of student services are available, including child care, counselling and support for students with disabilities.

Griffith University

Griffith University in Brisbane offers a range of undergraduate degree courses in electronics engineering, as well as postgraduate diploma and degree courses.

Web-based training at Bendigo TAFE

The Bendigo Regional Institute of TAFE (BRIT), offers a broad based electronics course catering to a wide range of interests and industry needs, delivering elements of courses in networking, communications, telecommunications and microprocessors.

BRIT has long had a reputation for innovation in the delivery of electronics training. From the early days of computer managed learning through to the World Wide Web, Jim Mark, the driving force behind WebTrain, has been at the forefront in the use of technology for the delivery of electronics training.

WebTrain is Internet software that can develop, deliver, assess and track training and education on the Web. As well as being a programming language for the web, WebTrain provides an online environment with built in messaging systems for communicating with your tutor or other people undertaking the same module. You can participate in threaded discussion groups in each module or just go in for a look at what is being discussed. Tutors can monitor student's progress, and can be of assistance to help with the more difficult sections. If students encounter difficulties with their studies, the tutors can be easily contacted from within the system.

A big advantage of the system is that students can study and learn when they have the time, and not be dependent upon other factors such as transport and work schedules.

(WebTrain is Internet based software jointly owned by BRIT and HALCH - a educational software company).

We've taken Engineering & Electronics to all levels

Studying at the University of Ballarat means you can choose from a wide range of engineering and electronic courses from TAFE certificates to Postgraduate degrees including doctorates.

WE HAVE EVERY LEVEL COVERED

TAFE – Certificates, diplomas and advanced diplomas in electrical, automotive, fabrication, mechanical, civil and electronic Engineering.

UNDERGRADUATE – Four year Bachelor of Engineering in disciplines of mechanical/electrical, mining and civil Engineering.

POSTGRADUATE – Graduate Diplomas, Masters and PhD degrees in Engineering.

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811 711, email
prospective@ballarat.edu.au
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UNIVERSITY of BALLARAT

A NEW WORLD OF OPPORTUNITES

Courses in Electronics

One of the undergraduate courses is the Bachelor of Technology in Microelectronics degree course, of three years full-time duration. A mid-year intake is offered. This course is designed to teach the relevant scientific and technological aspects of microelectronics. Students are introduced to the basic concepts and applications of both analog and digital microelectronics, and to the use of computers as a tool in microelectronics.

The first two years of the course share subjects with the Bachelor of Engineering in Microelectronic Engineering. The third year consists of supporting studies and an instrumentation project completed in the last semester. Graduates are well qualified for a range of roles including circuit designer, environmental monitoring systems designer, scientific officer, process controller, electronics support officer and research and development officer.

The Bachelor of Engineering in Microelectronic Engineering is a four year full-time course, and a mid-year intake is again offered. This course provides students with knowledge and skills in the scientific foundations, principles and procedures underlying the design of electronic circuits and systems; the use of computers in designing and testing such systems; and the application of this knowledge to areas such as communication and control systems, digital circuits and systems. Support studies in mathematics and relevant areas of science are also undertaken.

In years 2, 3 and 4 students complete a compulsory core of study, a series of subjects belonging to either the Communication Systems major or the Computer Systems major, and elective subjects. Part of Year 3 and half of Year 4 are dedicated to the Industrial Affiliates Program, in which an engineering design project is undertaken with an industrial partner.

An additional course provided by Griffith Uni is the Bachelor of Engineering in Microelectronic Engineering/Bachelor of Information

Technology degree, which is a full-time course of five years duration. This integrated course provides students with the scientific foundations, principles and procedures underlying the design and implementation of electronic circuits and systems.

Graduates of this course are qualified as both an electronics engineer and a computer professional, enabling them to work in both fields. In addition to more traditional areas of employment, they also have the capability to design and implement computer networks, sensor networks and remote terminal systems.

Griffith Uni also offers Master and Doctor of Philosophy degrees by research, as well as postgraduate diploma and Masters degree programs via course work. Examples include a Graduate Diploma or Master of Computer and Information Engineering, and a Graduate Diploma or Master of Communications and Information Engineering. These courses are designed for graduate professionals in the rapidly changing fields of communications, information and computer engineering. Students have the option of completing a Graduate Diploma over two semesters, or the Masters over three semesters.

Griffith's IAP

Griffith University also operates a highly regarded Industrial Affiliates Program, which enables students to use the extensive electronics resources of the University while working on important applied projects in a 'real life' situation with an industrial partner. The program therefore has a dual benefit: the student gains valuable practical work experience, while also assisting in the development of hi-tech 'intelligent' electronics for Queensland's industries. This is seventh year of the program and almost 250 students have now participated, working with around 150 companies.

In the 1999 Industrial Affiliates Program, 43 final year students in the Bachelor of Engineering in Microelectronic Engineering have been working within companies throughout Brisbane and the Gold Coast, extending their research and development departments and allowing special projects to mature which might otherwise take years.

Companies involved in the IAP program are enthusiastic in their praise. Typical is Andrew Loch of Micromedical Industries Limited, who said "This partnership with the university provides an excellent training ground for the student and gives us a very effective way of looking for prospective staff."

An interesting example of a joint project currently under way as part of the IAP involves new Queensland based company Filtronic Components Australia, and is expected to result in safer, more robust radar systems for aircraft and ships. Filtronic is an offshoot of a British based company, which moved to Brisbane last year and became part of the Industrial Affiliates Program in February.

"It was a good way to expand our Research and Development base here", said company spokesman Ashley Robinson. "We have had fourth year microelectronics and communications student, Ross Taylor, working on the project four days a week since February and we are moving into the testing stage already."

"Our aim is to develop a broadband power amplifier across 6 to 18GHz which will power radar transmitters on ships and aircraft", Mr Robinson added. "This will cover most of the frequency range required by the military in a single device. As a comparison the normal household microwave uses 2.4GHz and a mobile phone only 900MHz."

"At present antennas such as parabolic dishes are normally used. The power source, usually a large transmitter, is situated at some distance from the dish and this results in considerable loss of efficiency. We are developing a tiny unit which will feed the antenna right at the site, greatly increasing power efficiency."

The version currently being tested will generate five watts and use a monolithic microwave integrated circuit (MMIC) on a single chip. It is anticipated that the next generation will generate up to 8W and use field-effect transistors (FETs) as well as the MMIC.

Student Ross Taylor said he would be reluctant to leave the project.

BRIT ON LINE ELECTRONICS COURSES

Modules:

Electrical Principles 1	60 hrs	\$150
Electrical Principles 2	60 hrs	\$150
Analogue Systems	40 hrs	\$100
Feedback, Filters & Oscillators	40 hrs	\$100
Amplifiers 2	40 hrs	\$100
Circuit Analysis 1	60 hrs	\$150
Electrical Fundamentals	80 hrs	\$200
Maths for Electronics 1	40 hrs	\$100
Communication Fundamentals	40hrs	\$100

For further information:

Contact Jim Mark on (03) 5434 1534

or email: jmark@britafe.vic.edu.au

Enrolments available online at:
www.webtrain.com.au and select enrolments



BENDIGO REGIONAL INSTITUTE OF TAFE



"It is really great to put my theory into practice", he said. "It has reaffirmed my choice of research and study, and I am thrilled to be able to say 'I did that!'."

IAP research collaboration between Griffith University and Queensland company Baltec Systems will help the state's large power and smelting plants to keep their gas emissions as clean as possible in the future. Baltec Systems spokesperson Rodney Truce says ever-evolving technologies make it possible to continue to improve ways of collecting the offending dust particles from sites such as cement plants, power stations, alumina, steel, copper, zinc and other metal refining plants. Baltec currently supplies many of these plants with electrostatic precipitator controllers.

IAP student Mr Meechai Charatpattanawong has worked with Baltec for six months, analysing the current products and ways in which they can be refined to take advantage of new technology. "I have thoroughly enjoyed my time with Baltec Systems", Mr Charatpattanawong says. "It has been great to work on real projects in industry, especially when you can help to produce something useful."

Brisbane company Ti Diagnostic Solutions already provides auto mechanics and auto-electricians with state of the art equipment that can diagnose fuel injection problems without anyone having to crawl about under a car the old fashioned way. They too have joined the IAP program, to develop a lower cost and easier to use diagnostic system.

"The software and scope which is a new version being developed will be an addition to the Electra range, and will be even cheaper", explained company spokesperson Ian Roberts. "It will be very user friendly and suitable for PC's."

"This has been the first time that our company has worked with a student from Griffith's School of Microelectronic Engineering", Mr Roberts says. "It has allowed us to fast track the development of this new product. In fact, it would have taken a lot longer without student Paul Tuck."

"It has worked out very well for us and for Paul. The company has two or three more years research and development work ahead on various products", Mr Roberts added, "so I hope we will be able to continue our collaboration with Griffith's Industrial Affiliates Program."

Wireless Institute

For those who need assistance in one specific aspect of electronics — obtaining an amateur radio licence — the Wireless Institute of Australia's NSW Division provides correspondence courses for the two levels of theory examinations required for an amateur radio licence. Study materials such as books are included with the course. Trial examinations of different levels at the appropriate stage are given to enable the student and examiner to monitor progress.

The licence structure provides for a novice licence with a minimal technical level. This comprises transmitter operation and the basic stages of a transmitter, modulation types, receiver functions and characteristics of different antenna types for various frequencies. Propagation of signals via the ionosphere is also covered.

The next higher theory level is for the Amateur Operators Certificate of Proficiency and the Limited Amateur Operators Certificate of Proficiency. Here the courses cover in greater detail the functions of transmitter stages, the generation of single sideband signals, packet data transmission, frequency modulation, interference resolution and antenna types for HF, VHF, UHF and microwave bands.

All grades of licences are required to pass the same radio regulations examination. These regulations cover the frequency bands and transmitter power levels available for the amateur and the types of transmissions as well as their content.

For those wishing to operate on the HF bands, Morse instruction tapes are available as well as on air continuous transmissions.

Examinations are held regularly at the NSW Division offices in Parramatta and also at other WIA State Divisions. Many radio clubs throughout Australia also conduct classes and hold examinations. ♦

CONTACT DETAILS TAFE

Contact your nearest TAFE college, or phone:

ACT:	(06) 207 3191
Vic:	(03) 9628 4910
NSW:	(02) 9796 5444 or 131 600
NT:	(08) 8946 6666
SA:	(08) 8226 3409
WA:	1800 999 167
Tas:	(002) 337 378

Sydney Institute of TAFE

For further information on SIT courses and subjects,

La Trobe University

For more information on La Trobe undergraduate courses in engineering and electronics contact Mr Robert Dyson on (03) 5444 7424, or email to r.dyson@bendigo.latrobe.edu.au.

For information on postgraduate diplomas and degrees ring (03) 5444 7398 or email to mte@bendigo.latrobe.edu.au.

Deakin University

For further information on engineering and technology at Deakin, contact Trish O'Toole on (03) 5227 2033 or email to triss@deakin.edu.au.

University of Ballarat

For more information on the courses in engineering and electronics at the University of Ballarat contact Toni Lea-Howie or Gabrielle Hodson on (03) 5327 9510.

Griffith University

Electronics engineering courses at Griffith University: contact the School Administrative Officer on (07) 3875 5479 or email to j.byth@me.gu.edu.au.

Griffith's Industrial Affiliates Program: contact program manager Carol-Joy Patrick at the School of Microelectronic Engineering, on (07) 3875 5007, or email to cj.patrick@sct.gu.edu.au.

Box Hill Institute

Box Hill Institute, PO Bag 2014, Box Hill Vic 3128.
Phone (03) 9286 9840.

Website: www.bhtafe.edu.au

Sydney Institute of Technology

Building 1, Room IG-11, Mary Ann St, Ultimo 2007.
Phone (02) 9217 4170; fax (02) 9217 4018, or contact John Zervos, head electronic trades teacher on 02 9217 4773.
Email: SIT.BusinessCentre@tafensw.edu.au
Website: www.sit.nsw.edu.au

Stott's College

134 Flinders Street, Melbourne 3000.
Phone freecall 1800 069 020 for information on courses.

Open Learning Australia

An OLA student advisor can be contacted on (03) 9903 8955, or consult the OLA 1999 Handbook at www.ola.edu.au.

Open Channel

Write to: Open Channel, 13 Victoria St., Fitzroy 3065.
Email: openchannel@openchannel.org.au.
Website: www.openchannel.org.au

WIA (NSW Division)

Phone (02) 9689 2417, or fax (02) 9633 1525.
Email: vk2wi@ozemail.com.au
Website: www.ozemail.com.au/~vk2wi/Education.htm.

WebTrain (Bendigo TAFE)

For more information, or to enrol, contact Tracy Roberts on 03 5434 1673.
Email: troberts@britafe.vic.edu.au
Website: <http://www.webtrain.com.au>

Electronics Australia is one of the longest-running technical magazines in the world. We started as *Wireless Weekly* in August 1922 and became *Radio and Hobbies in Australia* in April 1939. The title was changed to *Radio, Television and Hobbies* in February 1955 and finally, to *Electronics Australia* in April 1965. Here are some interesting items from past issues:

50 years ago

October 1949

Colour Television Here: One of the most interesting news items of the month concerns the demonstration of colour television which took place at Britain's 1949 radio exhibition. The demonstration was undertaken by the Pye radio company, which supplied the equipment for the television demonstrations given a few months ago here in Australia.

The senior director of Pye, Mr Harmer, who came to Australia with that equipment, claimed that the colour television exhibited was a practical proposition. He said there was no reason why Australia should not use colour television for her initial equipment, because although transmitters would be more costly than those used for black and white, the reception would be equally good with black and white or colour receivers.

Broadcasting War in Europe: The futility of the radio war now being waged between Eastern and Western Powers in Europe is demonstrated by Russian success in jamming the 'Voice of America' and other stations broadcasting propaganda to the Eastern Zone. Despite the terrific barrage of power from the West's 66 transmitters, the Soviet has jammed the broadcasts.

25 years ago

November 1974

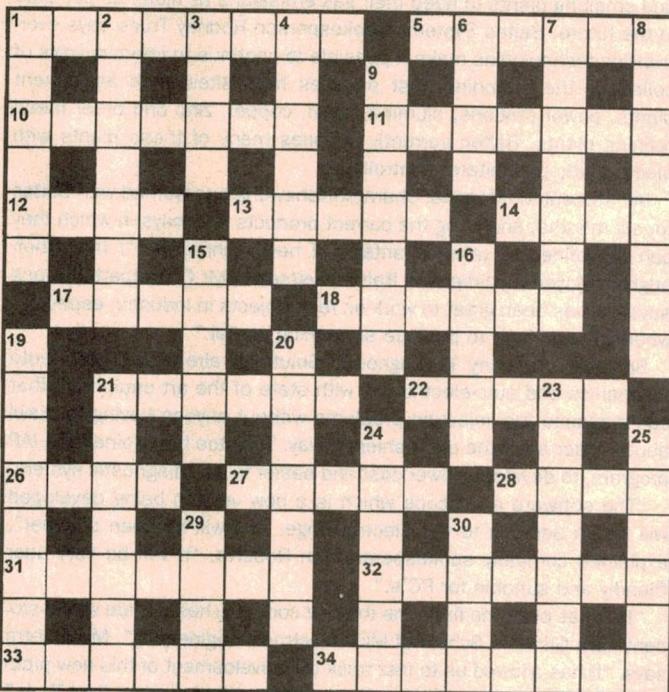
IRH Ups Metal Glaze Resistor Production: At a time when many Australian companies have been forced to close down their production lines as a result of the Federal Government's decision to reduce import tariffs on electronic components and equipment, IRH Components has spent several hundred thousand dollars on expanding its activities. And that's not all IRH has to boast about: the company is the largest manufacturer of resistive products in the southern hemisphere, and is totally Australian owned.

It is the metal glaze resistor, manufactured under licence to the ITC Division of TRW (USA), on which the expansion program is based. The resistors are now being made using a unique mass production process which has dramatically reduced the labour content and enabled them to be competitively priced.

TV Station Broadcasts Tornado Pictures: To most TV viewers in the United States, radar weather pictures are merely a means of helping the weather man to explain the forecast. But for many viewers of WAAY-TV in Huntsville, Alabama, radar proved to be a life saver.

Recently WAAY-TV's weather radar tracked a series of tornados heading towards Huntsville, and the station transmitted live pictures which allowed viewers to vacate their homes in time. ♦

Crossword



Across

- Useful range of radio frequencies. (8)
- Time differences in wave cycle. (6)
- Re-inserts cassette, etc. (7)
- Radio frequencies used for TV, etc. (1,1,1,4)
- Originator of law of induced current. (4)
- Globes. (5)
- Control device. (4)
- Frequency unit. (5)
- Solution. (6)
- Common conductor. (6)
- Coordinated group of antennas. (5)
- Binary digit. (4)
- Caribbean group: ... band. (5)
- Short repeated phrase of music. (4)
- Short sleeve on a sleeve! (7)
- Basis of one kind of navigational system. (7)
- Convert data. (6)
- Said of equipment handling large frequency range. (4-4)

Down

- Periodic variation in pitch. (6)
- Relative combining power of an atom. (7)
- Set threshold value. (4)
- Brand name of copier. (6)

October's solution:

V	A	R	A	T	O	R	F	A	T	O	R
I	E	O	U	A	B	W	A				
C	H	A	R	I	O	T	R	E	B	U	I
T	C	L	G	G	R	S	I				
O	P	T	O	R	O	T	A	T	A	A	
R	O	S	I	N	S	O	T				
G	R	A	T	I	G	E	S				
O	R	G	O	E	R						
P	A	V	L	O	V	A	V	I	A	T	O
E	O	P	S	E	M	X	E				
R	O	L	L	U	R	W	I				
A	T	O	O	T	Z	D	I				
T	R	A	C	T	O	U	L	U	L	A	N
O	I	T	M	R	L	N	O				
R	E	C	T	O	R	I	N	D	U	C	T

Electronics Australia's Professional Electronics

Education and training feature

A look at Red Hat Linux 6

Seagate's third generation
hard drives

EPIRBs become GPIRBs with
new GPS system



Iomega's new ultra-slim Zip drive holds 250MB and has USB support

Automated inspection
system uses 'smart
camera' with no
programming needed.



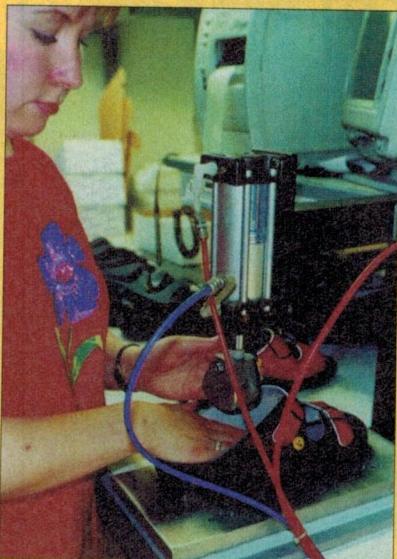
HIGHLIGHTS

MP3s are better than sex

For perhaps the first time in Internet history, the word 'sex' has fallen from its place as the most searched for word on the web. It has, instead, been replaced by another three-letter word: MP3. Yes, according to the recently established www.mp3.com.au, MP3 is now the web's most popular word, which shows just how well the new compressed audio file format has been taken up by the world at large.

High tech footwear

A major blow was dealt to the fashion industry today by the Finnish company Laitosjalkine Oy, when they released their new series of working shoes specially designed for the electronic industry. These so-called ESD (Electrostatic Discharge)



shoes efficiently eliminate the problems associated with static electricity, and were presented for the first time at the Helsinki Electronics Exhibition.

"We have to pay more attention to ESD protection," said Sakari Anttila, MD of Laitosjalkine Oy. "A good way to protect everybody against static electricity is to make personnel wear such shoes at work".



Super Train: in a pioneering project for the next millennium, Deutsche Bahn is building the ICE3 train, which is to travel along a new track between Frankfurt/Main airport and Cologne at 300km/h. From 2002, the train could replace regional air traffic. (IN-Press)

Dial a drink?

Communications giant Telstra have recently started testing a combined vending machine and pay phone developed in conjunction with the Coca-Cola Company. Aimed at young people, the idea behind it is that a bunch of kids hanging around a pay phone might as well buy a bottle of Coke while they're at it. At the same time, the machine can use the phone line to send sales and call traffic information to the central database, allowing for easy stock control and sales tracking. Quite how you're supposed to talk to your friends with a mouthful of Coke is still under investigation, of course...

There and back again

IC failure analysts will be glad to know that Sonoscan have developed a new IC-imaging technique called STAR Scan (Simultaneous Thru-scan And Reflection Scan). Thru-scan is a transmissive imaging technique, projecting an ultrasonic beam through a chip, and seeing what comes out the other side. Any cracks, delaminations or disbonds in the chip block the beam, showing up as shadows on the interpreted image. Thru-scan cannot however determine the actual depth of a fault, and this is where reflection-mode imaging comes in. This mode uses a single transducer to bounce ultrasound off any faults in the material, and by timing the echoes, the exact depth can be

determined. Both of these techniques are already in use in the industry; what Sonoscan has done is to combine both procedures into a single-pass scan, greatly reducing the time and effort required to scan a single chip.

Copper the way to go, says Berkeley

A new way to inlay copper wires in the semiconductor wafers promises to open the way to ever more densely packed chips beyond the year 2000. Othon Monteiro of Berkeley Labs has devised a method of 'ion-assisted trench filling', to deposit the copper interconnects used to create integrated circuits - replacing the old-fashioned aluminium interconnects used until now. "As device sizes get smaller, the electrical properties of aluminum will not meet the new requirements," says Monteiro, a materials scientist in the Plasma Applications Group of Berkeley Lab's Accelerator and Fusion Research Division. "We need lower resistivity and greater resistance to electromigration."

The Semiconductor Industry Association predicts that new lithography methods will reduce today's smallest chip features, already as fine as 250 nanometres, to 100 nanometres by 2006, and even finer dimensions in the years beyond — making it possible to pack hundreds of millions more electronic devices on a chip.

Monteiro, who has applied for a patent on

ion-assisted trench filling, says that what amazes him about the semiconductor industry "is that they know where they want to be without knowing how they're going to get there, but somehow they always do."

NASA tests exotic technologies on cosmic highway

NASA's Deep Space 1 mission has successfully demonstrated most of its exotic technologies in space — including an ion engine that is expected to be ten times more efficient than conventional liquid or solid rocket engines, proving they are ready for use in science missions of the 21st century.

Of the 12 advanced technologies onboard the spacecraft, seven have completed testing, including the ion propulsion system, solar array and new technologies in communications, microelectronics and spacecraft structures.

"We've taken these technologies around the test track, and now they're ready for the production line," said Dr. Marc Rayman, deputy mission manager and chief mission engineer for Deep Space 1 at NASA's Jet Propulsion Laboratory (JPL), Pasadena, CA.

Launched late last year, Deep Space 1 is the first mission under NASA's New Millennium Program, which features flight testing of new technology, rather than science, as its main focus. These new technologies will make spacecraft of the future smaller, cheaper, more reliable and more independent of human control.

GEOSAR takes the 'search' out of search and rescue.

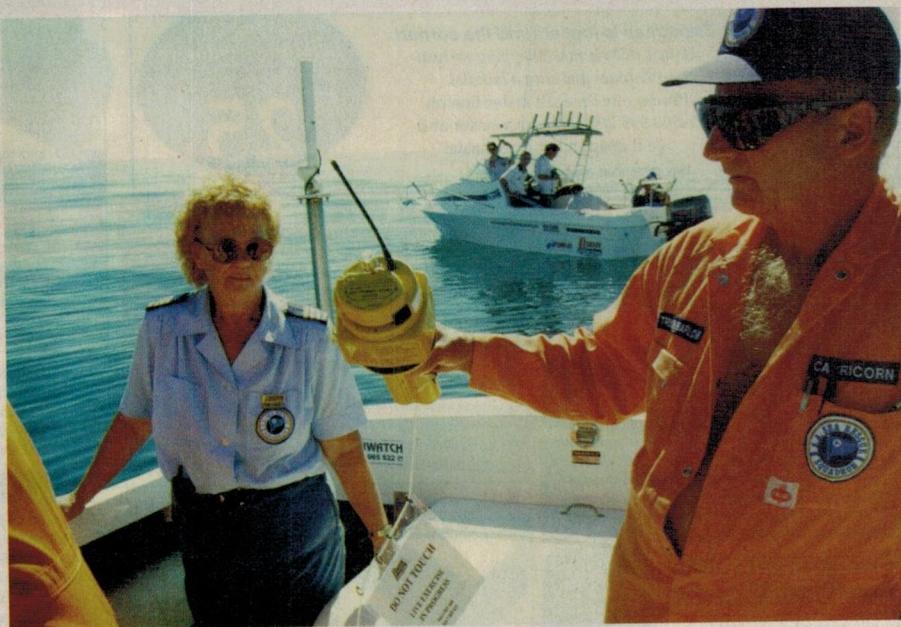
Next time you go sailing, be sure to have a GPIRB on board.

In a recent simulated emergency search and rescue operation, one new GPIRB (Global Position Indicating Beacon) and two EPIRBs were dropped in mystery locations in S.A.'s Gulf St Vincent.

The new GPIRB signal was received, identified and its latitude/longitude established within three minutes of the unit's activation. The GPS location was given to SA Rescue Squadron's boat, <I>Sea Rescue One</I>, who retrieved the GPIRB within 30 minutes, and within 100 metres of the coordinate fix given.

Meanwhile the EPIRBs fared not so well with the most up to date 406 EPIRB being found around one hour after the GPIRB rescue and the more conventional EPIRB being found by boats following a search pattern directed by SA's Sea Rescue H.Q.

New GPIRB units use EPIRB technology to transmit a distress call, but also utilise the GEOSAR system of four geostationary satellites that give constant coverage from 70° north to 70° south, and provide instant call recognition almost anywhere in the world.



GPIRBs also carry an onboard GPS engine, which locates itself by normal GPS satellites, and loads its current position into the emergency transmission. The GEOSAR can initiate a response within seconds of a unit's activation, and the GPS engine can reduce the search area to within 100 metres, as well as track the unit's drift by re-stating its location every 20 minutes. The inclusion of unique identifier codes which give things like the name and usual haunts of the GPIRB's owner, as well as the type of vessel (or vehicle) and the usual number of people on board. This information coupled with the coordinates of the signal's point of origin gives rescue crews not only location but also how many people may need to be accommodated in rescue vehicles, allowing rescuers to make better use of resources and improve their chance of success while minimising costs.

Sanyo provides digital music

The Sanyo Electric Company has officially announced the introduction of its digital music delivery device — a portable player that can play back digital music downloaded from the Internet. Sanyo plan release to the global market in the spring of 2000.

Employing the Digital Signal Processor (DSP) technology perfected by Texas Instruments, and the Secure Digital Music Initiative (SDMI) technology developed by Liquid Audio Link for the commercialisation of portable players, Sanyo will be able to produce higher quality players with far greater capabilities than existing units.

Sanyo will also develop kiosk terminals in the near future, for digital content delivery to portable players over the counter. Set up in record shops, convenience stores and other

public institutions, the music a person wants to hear can be listened to and purchased in units, using the terminal.

Bassett Acoustics awarded for Adelaide Festival Theatre

The South Australian Division of The Institution of Engineers, Australia, has awarded Bassett Acoustics with an Engineering Excellence Award in the category of Innovation, for its involvement in the improvement of acoustics in the Adelaide Festival Theatre. The auditorium's new acoustic was unveiled during the stage of The Ring Cycle in November last year to a flood of critical acclaim from local and international opera patrons and critics.

Bassett combined traditional architectural acoustical engineering with a novel electro-acoustical system comprising microphones, digital signal processing and loudspeakers to optimise the acoustical performance of the auditorium for a range of performance styles. The electro-acoustical system allows the acoustics to be altered at the push of a button.

The project involved a substantial component of Australian research and development input, including the design of new loudspeakers by VAF Research and network controlled power amplifiers by Australian Monitor. The audio equipment is implemented as a virtual sound system in Peavy Media Matrix and uses a Crestron colour touch screen control system to allow non-expert adjustment of the system settings.

"We are very pleased for the recognition this award brings", said Dr Peter Swift, Principal of Bassett Acoustics. "We believe there is a strong future for this technology both in improving the acoustics of existing auditoria and in making new auditoria more flexible". ♦



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Jack O'Donnell, Managing Director

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Great for your mobile toolbox, or for a student lab kit. Includes continuity buzzer, K' type thermocouple and square wave test signal output. Measures DC Volts to 1000V, DC Amps to 10A, AC Volts to 750V, resistance to 2MΩ and temperature from -20°C to 1370°C. It even includes a diode test function!

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Ideal for schools, production lines, workbench, R&D departments, etc.

Features: • Japanese ceramic 60W heating element • ±2% precision • Dual mode LED display (switch between tip or preset temperature) • Heater insulation of over 100MΩ • Zero voltage switching • 200° to 500°C temperature range • Ergonomic design • Slide out cleaning tray • Grounding point for ESD protection • 2 Year Warranty • Temperature calibration adjustment • Set and lock temperature setting - using the allen key provided, the temperature setting can be locked to a specific setting • Supplied with Long-Lasting Iron Clad Tip

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Superb quality UL approved meter, ideal for hobbyist and professional alike, featuring fuse protection on current inputs, large high contrast 3.5 digit LCD display, high quality instrument leads, built-in stand and rugged construction.

- True RMS AC measurement to 5kHz
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Includes a FREE set of extra batteries! (RRP \$4.50 Value)

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The first 100 callers to purchase either product will be entitled to a roll of T 1100A solder PLUS a T 2449 Butane Refill **FREE!!** (Valued at \$10.45)

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T 2590 Was \$49.95 T 2592 Was \$79.95 Complete Kit

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Protect your valuable vehicle with this fully featured, compact car security system offering the latest anti-scan, code hopping, technology.

Features: • Multi-function remote • Shock sensor • Starter immobiliser • Valet mode • Selectable auto arming • LED Status indicator and a myriad of user programmable options. (Refer to our 1999/2000 Catalogue for more details)

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All four doors will automatically lock & unlock with the operation of either of the front doors by simply adding this kit!

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All models feature: • Composite video output suitable for direct connection to the video input on a VCR, Monitor or an AV transmitter. The addition of an RF modulator can also allow the camera to connect to the antenna input of a TV or VCR • Simple 3 wire connection • 500 x 582 pixels • 380 lines • 12V DC Operation

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SCOOP PURCHASE
The S 9001 offers a wide 130° viewing angle (normally 92°), for a greater viewing area.



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S 9001 Was \$139 S 9005 Was \$135 S 9008 Was \$139
B&W 130 Degree B&W + Audio B&W + Audio
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The S 9080 uses a genuine Sony® 420 lines Hi-Res CCD Sensor, Swivel mounting bracket, Internal regulator - Does not require expensive regulated supply, Non-Corrosive Brass Housing unlike others on the market!

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Easy to install with only 4 wires to connect, it has a coverage of up to 2,000 feet. No power required and a BNC-RCA adaptor included

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A must for serious cyclists!

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Desolders a
14 pin IC in
around 30
seconds!

The T 1280 makes it a breeze to remove components from any PCB, even double sided through-hole plated boards. All it needs is a squeeze or two on the trigger and the component virtually falls out.

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T 1280 Was \$349
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The first 50 callers to purchase a T 1280 receive a T 1274 Bench Stand, valued at \$24.95! The T 1274 keeps your T 1280 safely upright on your bench and shields the hot element!

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This quality aluminium tool case measures 460 x 325 x 150mm.

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*Tools pictured in box not included



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Set with every T 5020
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(EA June '99) Protect your valuable equipment from destructive power spikes. See website for full details.

K 6048 **\$59.95**

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(EA Sept. '99) Add titles to your home videos or surveillance video tapes. See website for full details.

K 5878 **\$75**

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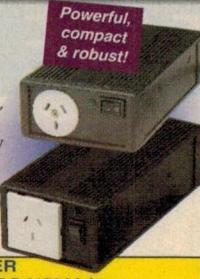
1 year minimum warranty: 12 months from date of supply. Goods becoming faulty in this period should be returned to our premises with evidence of purchase and \$6 money order, cheque or stamps to cover return postage.

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These amazing inverters provide 240V AC power from your car cigarette lighter socket! Ideal for powering televisions, VCR's, lights, battery chargers, shavers, fax machines, etc. Features low battery indicator and overload shutdown. M 8110 fitted with car cigarette plug, M 8115 fitted with screw terminals for either car cigarette plug or crock clip lead (included).



Powerful,
compact
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Every M 8110 includes a FREE P 0150 Lighter
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Plug-Pack Charger

Charge your batteries in less than 8 hours with this versatile charger! Charge either 2 (5hrs charging time) or 4 (7hrs charging time) AA batteries at a time. Suits Nicad or Ni-Mh



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A 0285 Was \$19.95
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UHF Remote Control Switch

This little gadget can easily be used to create a simple panic alarm, remote lighting control or to control any item remotely.

Ideal for controlling
your lights, garage
doors, etc

Operates in 3 modes:

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Premium Quality Rechargeable Cells! At these prices, it won't take long for these to pay for themselves compared to carbon or zinc-alkaline batteries!



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4+
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4+
NOW \$6
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S 4200 100mAh
9V Size Was \$12.95

2+
NOW \$8
4+
\$7.50



Santa's Xmas Tree Lights Kit

This nifty little project consists of five strings of super bright LED's that flash in a random pattern to jazz up your xmas tree!

Features: • Variable

flash rate • Low

Voltage (Suitable for kids) • Easy construction • Modular design allows you to add more LEDs anytime!

K 1150 **\$24.95**

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Indoor & Outdoor Thermometer

Features • Dual display for internal/external temperatures • Memory function • 3m lead • Desk or wall mount

SAVE
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Ideal for use in hydroponics, garden centres, shade houses, monitoring air conditioning, aquariums, wine cellars, etc.



24 Pcs Combination Kit

Includes: • Side cutters • Long nose pliers • 6 Jeweller screw-drivers • Tweezers • Handle plus extension bar • 4 Sockets, 7, 8, 9 & 10mm • 9 bits, 2 Phillips, 2 Slotted and 5 star. All housed in a plastic fold up case.



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Simply plugs into your car's cigarette lighter socket.

Includes SEVEN interchangeable tips to suit most DC power sockets. Fuse protected. All voltage settings except 12V are regulated 1.5, 3, 4.5, 6, 7.5, 9, 12V @ 500mA.

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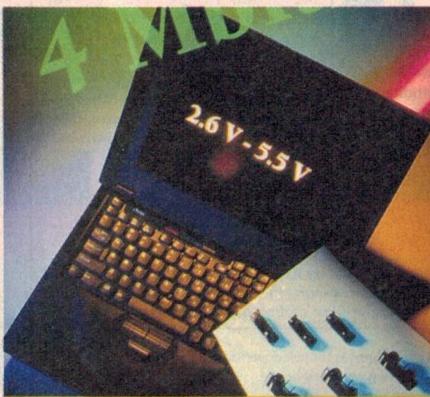
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SOLID STATE *Update*

LATEST DEVELOPMENTS IN SEMICONDUCTOR TECHNOLOGY



IrDA transceivers run at up to 4Mb/s

Vishay Telefunken has released what it claims as the industry's first IrDA-compatible transceivers capable of fast-infrared operation from voltage supplies ranging from 2.6V to 5V. Offering data rates up to 4Mb/s, the new devices are the first on the market to offer full performance across this voltage range and to be functional at voltages as low as 2.4V, allowing OEM designers to use a single device for 2.6 - 5V designs in notebook computers, digital cameras and other systems.

The six new devices offer designers a choice of three package styles. Side-view (TFDS) and top-view (TFDT) devices are packaged in a surface-mount package measuring 13 x 5.3mm with a height of 5.6mm, while devices in the company's BabyFace package (TFDU) can be mounted for either top or side orientation and measure just 9.7 x 4.7mm with a height of 4mm.

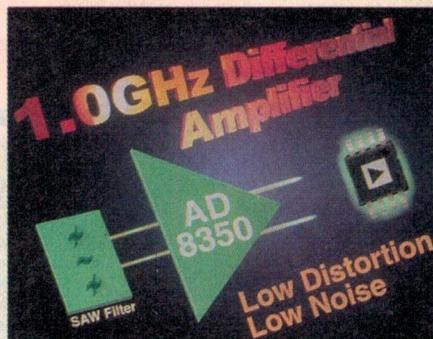
By integrating the preamplifier of the receiver and the driver stage of the transmitter, the new devices combine the functions of two ICs and eliminate a large number of discrete components. Many competitive solutions require up to nine discretes, the new Vishay Telefunken products, by contrast, require as few external components as a current-limiting resistor and bypass capacitor.

To minimize power consumption and prolong battery life in notebooks, palmtops, PDAs, and digital still and video cameras, the new devices are specified for a supply current of 3mA while operating and just 1uA in shutdown mode. A split power supply design allows transmitter and receiver to be powered independently and further saves on battery life.

For more information contact Vishay Intertechnology, 63 Lincoln Highway, Malvern PA 19355-2120, USA.

1GHz differential amp is very linear

Analog Devices Inc (ADI) has announced a new intermediate frequency (IF) differential amplifier IC with the high linearity, low noise performance required for cellular base stations, cable modems, set top boxes, radio link, instrumentation and



other IF applications.

Until now, designers have struggled with more expensive, cumbersome, discrete designs with poor performance. As part of ADI's initiative to bring precision to the RF/IF market, the AD8350 provides a monolithic integrated circuit in a tiny footprint to meet the need for high performance, smaller and lower weight solutions.

Designed to meet the demanding performance requirements of communications transceiver applications, the AD8350 makes possible a high dynamic range differential signal chain with exceptional linearity and increased common-mode rejection. This makes circuits less susceptible to noise, resulting in high-quality, reliable wired and wireless communications. The AD8350 can function as a variety of devices, including a general-purpose gain block, an ADC (analog-to-digital converter) buffer, and high-speed data interface driver.

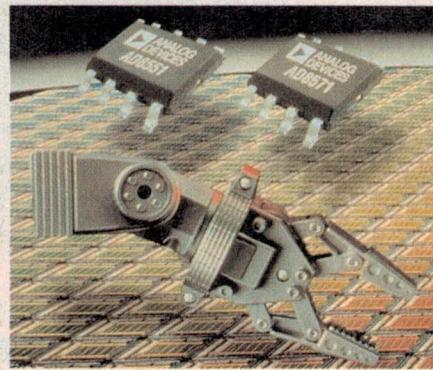
The AD8350 enables a completely differential IF circuit, from the IF output of a mixer to the baseband device. The amplifier's gain offsets typical filter losses, maintains high common-mode rejection ratio (CMRR) and is easily impedance matched. It can also be used as a single-ended to differential conversion device.

For more information contact Analog Devices, Suite 4/1621 Point Nepean Road, West Rosebud 3940.

'Most accurate' 3-5V auto-zero op-amps

Analog Devices Inc has announced the release of the AD855x and AD857x families of high performance, low-cost, auto-zero op-amps for high-volume applications. Through extensive enhancements to proven design architectures, the AD855x/AD857x are claimed as the world's most accurate 3 - 5V op-amps. The enhancements also allow ADI to price them at half the cost of competitive parts.

According to ADI earlier entrants to the low-cost, auto-zero amplifier market compromised performance, forcing design engineers to worry over error budgets and spend additional design time compensating for op-amp performance. Their only alternative was to buy expensive chopper amplifiers, generally priced well beyond most high-volume cost constraints.



With greater than 20-bit accuracy, the AD8551/8552/8554 and AD8571/AD8572/AD8574 op-amps offer uncompromised performance. Design engineers can easily meet error budgets and cost constraints, save design time and improve time-to-market.

Specific features for the two families include offset voltage as low as 1uV over a -40 to +125°C range; almost immeasurable drift over time and temperature; lowest voltage noise among auto-zeroing amplifiers and no 1/f noise; and the shortest overload recovery time (250us max, 50us typical) among auto-zeroing amplifiers.

For more information contact Analog Devices, Suite 4/1621 Point Nepean Road, West Rosebud 3940. ♦

A look at Linux with red hat 6.0

Red Hat 6.0 is out, and with a raft of improvements over Red Hat 5.2, it could well give Windows a run for its money. With a decent GUI and a host of included software, there's even more reason to give it a go.

by Jean-Baptiste Cattley

There's no doubt about it, Linux is gaining a huge amount of popularity. No longer the exclusive domain of the technological elite in the IT sector, Linux is starting to find its way into the home/hobby market, with inroads into the SOHO sector as well. With the release of Red Hat 6.0, Linux has come one step closer to being the perfect consumer OS. So is Linux ready to compete against Windows in the desktop market? Depends where you stand...

Getting Linux

One of the main selling points of Linux is the fact that it's actually free. The kernel, the base libraries and more software than you could shake a stick at are all available for download on hundreds of FTP sites across the world. All you (theoretically) need to do is download all the required packages,

and install them on your machine.

Due to the rather staggering amount of organisation it takes to build a Linux system from scratch, however, there are a number of organisations and companies out there that put together their own 'distributions' of Linux (such as Debian, Caldera, SuSe, Slackware and Red Hat), each with their own configuration and extra software. There's no 'best' distribution, but Red Hat has a reputation for being the most usable by non-geeks, and is possibly the most professional.

If you go and buy the boxed set of Red Hat, the first thing you'll notice is that far from being given away for free, it'll set you back somewhere between \$85 and \$125 — almost as much as Windows 98! What you're paying for here is not the software itself, but for having the whole collection on a bootable CD, and a 30-day tech support contract.

You also get another CD with the full source code of the whole operating system, a CD full of full and trial versions of Linux applications, and two very handy printed manuals. It's amazingly cheap, and you get your money's worth, no question.

Installation

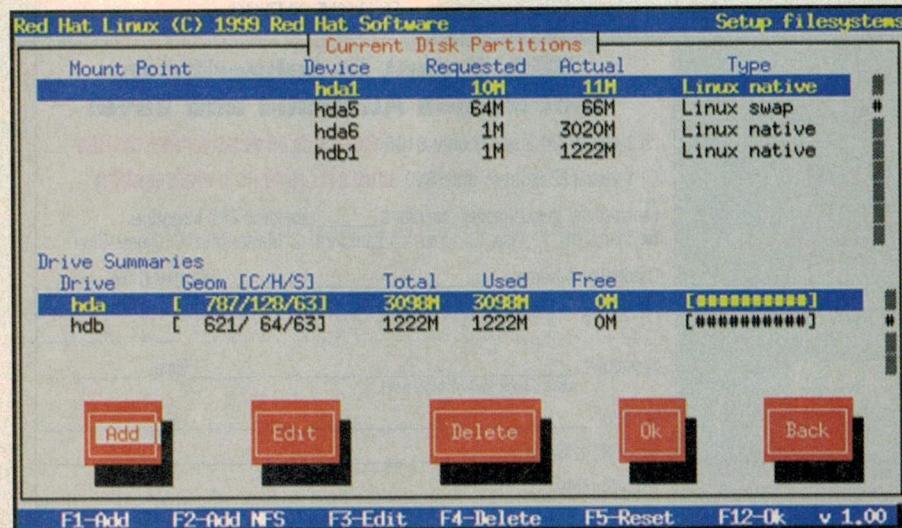
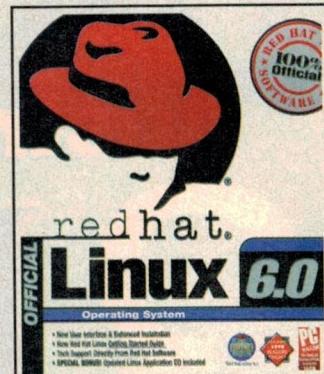
RH6 will install on just about anything; if you don't want the GUI, you could probably get away with a 486/50 with a couple of hundred megs of disk space, but if you want to get the most out of it, give it at least a Pentium 150 and half a gigabyte. Installation itself is straightforward, the CD is bootable, however you do have to partition your hard drive — a first taste of the hands-on approach you need to take with Linux.

Once you've done that, and you've configured X-windows for your video card — the only other tricky part of the install — you're pretty much away. As with everything Linux, the setup process has been designed for power users — the default options are not always suitable, so you need a little general wherewithal, and the ability to read the manual to find the answers you need. If your VCR still blinks 12:00, you might get stuck here — but I think the average EA reader can probably handle it.

GUI eyed

Possibly the biggest change to Red Hat since version 5 is the inclusion of a couple of decent graphical user interfaces, namely Gnome/Enlightenment and KDE. Also, the system now starts the GUI at boot — so you never have to deal with a scary-looking text console if you don't want to. This is a huge step towards getting the average user to use Linux — Windows 95 has lead people to treat the GUI as a integral part of an system, and the lack of a single standard interface in Linux has scared a lot of people off, until now.

Gnome, along with the Enlightenment win-



Partitioning your hard drive ready to install — and this is the user-friendly version of the partitioning software. Not for the faint-of-heart, but if you can get through this, the rest is easy.

dow manager, is the latest and greatest GUI for Linux. It has all the bells and whistles you could hope for, including a Win95-looking taskbar, multiple desktops, Themes support, Intellimouse support, session management — you name it, it's got it.

Unfortunately, while it looks great, the 'feel' isn't quite up to scratch... the whole thing's a little clunky, and the default window behaviour can be downright annoying. Much nicer, in my opinion, is the KDE environment. (which you can set as the default with the 'switchdesk' command.) It lacks some of the amazing features of Gnome, but the interface looks a lot cleaner, feels a lot snappier, and is generally a lot simpler and easier to use.

Both interfaces are *almost* as usable as Win95, but if you're used to Windows, you'll miss little things like having right-click edit menus for every text control, and fully-integrated drag-and-drop. It's very tempting sometimes just to reboot back to the familiar surroundings of 95, and complain about Explorer for a while...

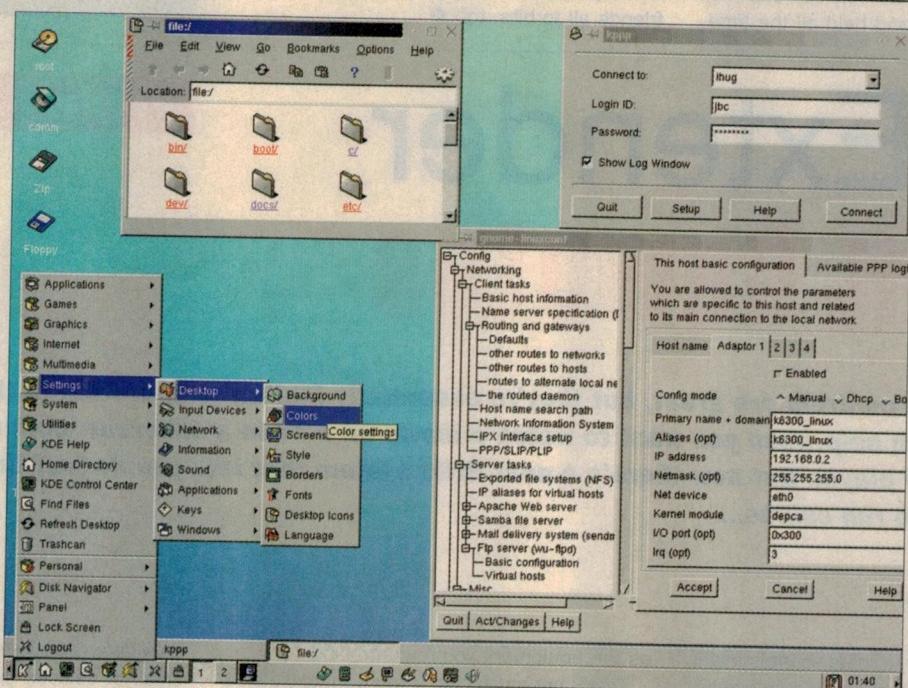
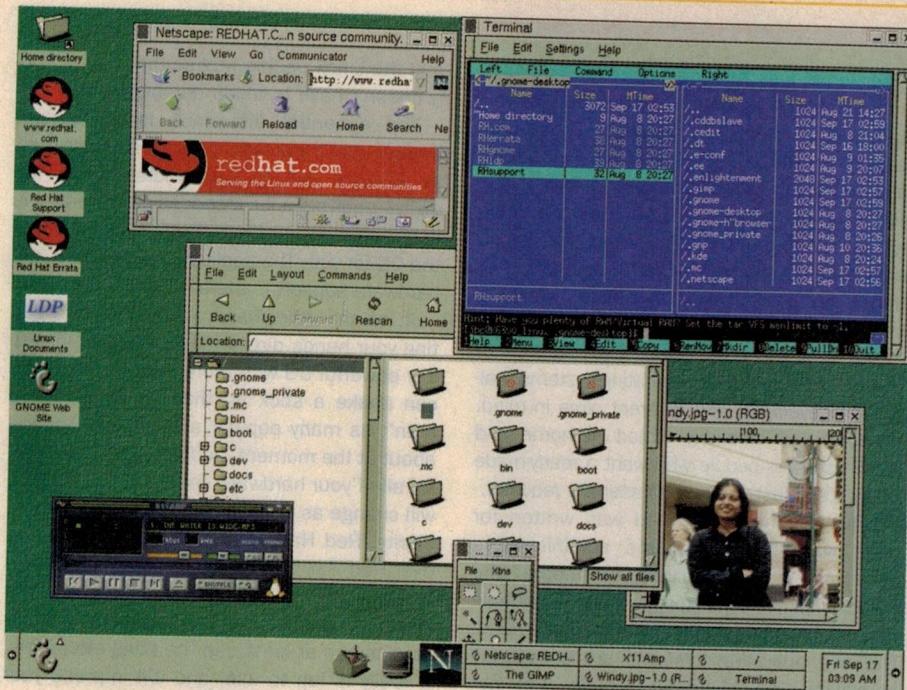
Neat Stuff

RH6 includes some downright nice graphical tools, including linuxconf, a rather handy graphical configuration tool that lets you set up everything from boot options to network adaptors to file sharing... It's so much easier than fiddling round in a million configuration files manually, though you are of course free to do so if you want.

There's also kppp, an internet connection manager that's even easier to use than Dial-up Networking in Windows — if you ever tried to get PPP

working under Red Hat 5.0, you'll realise what a boon this is. Netscape Communicator comes installed as standard, and there's a huge amount of other software that comes with the average installation — including The GIMP, an image-manipulation app to rival Adobe Photoshop, email packages, web browsers, personal organisers, media players, games, utilities... the list goes on.

The included Applications CD includes StarOffice, an interesting office suite that I mentioned in the July 1999 Computer Clinic column, although to be honest the rest of the software on the CD is not really aimed at the average home user.



Gnome, the default GUI installed with RH6... it looks cool, but it's a little clunky to use every day.

KDE: older than Gnome, and not so annoying... it looks a lot more professional too, and is a lot nicer to use.

The Way of the Penguin

So what's it like to actually use? Well, the provided apps are all fine, if a little, um, alien, and the GUI is nice enough, though again, it takes a little getting used to. There's certainly nothing you can't do in Linux, and the thing pretty much *never* crashes, but it still takes a fair bit of nous to get the whole thing working.

One reason for this is the somewhat decentralised nature of the system — there's no 'My Computer' for central resource management, and there's no system registry to keep all of the configuration data. Due to the open-source nature of Linux, the operating system

is a loose collection of components that happen to work together — and so keep their configuration files and settings wherever the individual programmers saw fit to put them. This means that if you need to change something, you have to hunt through the docs hoping to find a mention — assuming you know what you're looking for.

I got nearly everything working the first day, but getting my soundcard working was a pain, and sharing files with my NT box took hours of scrolling through decidedly vague documentation and looking things up on the net. That's the biggest problem with Linux, even now: you really have to hack around and experiment in

order to get it all running smoothly.

If you're not afraid to do that, though, you can have a lot of fun, and use some really great software on a platform that's rock-solid and incredibly powerful. Best of all, when you're ready to move up from a simple desktop implementation, Linux is ready to use as a fileserver, internet router, web server — things you could spend thousands on for a commercial operating system.

The trouble with comparing Linux with Windows is that the two operating systems really were developed with different aims in mind. Windows was squarely aimed at home and office users — people who want a ready-made system that just works, no assembly required.

Linux on the other hand was written for (and by) hackers, systems administrators and type 'A' personalities — people who spurn wizards, talking paperclips — people who enjoy editing configuration files by hand. The two operating systems are converging somewhat, as Microsoft realise that not everyone wants their hand held all the time,

and the Linux people realise that user-friendliness doesn't have to mean dumbed-down.

The essential difference is still there, though, and if you want consistently high-quality software with no soul whatsoever — the digital equivalent of Macdonalds — and you don't mind paying for it, then Windows is still the OS for you. The applications are there, the hardware support is there — you're set.

If, on the other hand, you don't mind getting your hands dirty and you want an incredibly powerful OS with more features than you can shake a stick at, then go Linux. There aren't as many popular applications floating about at the moment, and getting full support for all of your hardware can be tricky, but this will change as Linux continues to gain in popularity. Red Hat 6.0 is a huge improvement over Red Hat 5; now that it boots straight to a very usable GUI by default, and has some decent graphical configuration tools, virtually anyone can at least use the thing effectively. It really is fun to use, and it'll impress your friends all to bits, too. ♦

Red Hat Linux 6

Good points: Cheap, effective, Gives Windows a run for its money.

Bad points: Still not quite there yet in the installation side of things.

RRP: \$85 (cheap!)

Available: Netcraft Australia, P.O. Box 390, Blackwood, SA 5051. Phone: 1800 454 689; Fax: (08) 8278 8325; email: sales@netcraft.com.au; Website: www.netcraft.com.au/redhat

Web links

- [www.redhat.com]
- [www.netcraft.com.au/redhat]
- [www.debian.org]
- [www.linux.com]
- [www.slackware.com]
- [www.calderasystems.com]
- [www.gnome.org]
- [www.kde.org]

RF Extender for IR Remotes

Product Review

Infra-red remote controls are great, but they're essentially limited to operation in the same room — not much help when you want to watch a movie on a TV in a different room from your VCR or DVD player. But now there's a neat little system that lets you do just that, without having to run cables...

by Jim Rowe

A FEW YEARS AGO, remote controls might have seemed a bit of a 'rich man's indulgence' when it came to driving the entertainment gear in a typical loungeroom. But nowadays, what with our VCRs, CD players, set-top boxes and DVD players, they're almost essential — if you're hoping to sit down and enjoy the movie or music, anyway.

The infra-red (IR) remote controls supplied with most modern consumer gear are usually very reliable, too, although they do have one limitation. Because they rely on what's still essentially optical communication (albeit at a wavelength invisible to human eyes), they do need a reasonably clear 'line of sight' to operate. Sometimes you can 'bounce' the beam from a ceiling or wall, but even so you really need to be at least in the same room

as the equipment you're controlling.

That's not much help if you want to watch a movie on a TV in another room, which is why some up-market AV gear is fitted with 'wireless' remote control — using UHF radio waves instead of infra-red. Unlike IR radiation, UHF waves can go through typical internal walls and floors/ceilings, so controlling things from a different room is generally quite feasible.

UHF remote controls have limitations of their own, of course. They're more susceptible to outside interference, for example. But they do have the advantage of operating through walls, floors and ceilings.

So what, I hear you ask. Since most of us are stuck with IR remote controls, how do we solve the need to control things from a different room?

Well, there've been 'wired' extenders avail-

able for a while, even in kit form. These have a small IR detector unit which you can locate in the room you want to do the controlling from, and a matching IR 're-transmitter' unit which is placed in front of the VCR, DVD or other gear you want to control, wherever it's located. The two are then linked with a cable, so that when you use your remote control(s) in one room, the extender system reproduces the IR pulses back in the other room to achieve the desired control.

Which is great, of course. Except for the fact that you have to run a cable, from one room to the other. This can be a *real* pain, even when it's feasible. Often it's almost impossible, especially if you want to do the job neatly. There *must* be an easier way, surely!

Yes, there is — now, at least. Jaycar Electronics is now offering a neat little 'RF



Remote Control Extender' set, the AR-1805, which allows you to use your standard IR remote(s) to control gear in another room without having to run any cables at all. It consists of two compact and unobtrusive little transponders, one of which sits on the top of the TV you're viewing, and the other somewhere in front of the VCR or DVD player, etc., where it's facing the latter's IR detector. Once they're in position, and hooked up to their individual 'plug pack' power supplies (included), the system is ready to use without further ado.

The two transponders are virtually identical, apart from labels identifying one as the Transmitter and the other as the Receiver. (The Transmitter has the IR detector/UHF transmitter, and goes in the room where you are, while the Receiver has the UHF receiver/IR emitter, and goes in the room where the equipment is.) They each consist of a base 60mm square and 25mm high, with a half-cylinder 'eye' section on top measuring about 48mm wide and 32mm high, with curved red filter on the front. This both pans from side to side through +/-45°, and/or tilts back by about 80°, to make it easier to line

up the IR path at each end.

On the top of each unit there's also a short vertical UHF wire antenna, about 110mm long and ending in a tiny circular loop for safety. The units operate on a nominal frequency of 433.92MHz, which is allocated for this type of use. The transmitter unit has a rated RF output of 5dBm +/-5dBm (roughly 2 - 3 milliwatts), giving a range of up to 100m with no intervening walls, etc.

Although the base part of both units has a compartment with a removable bottom lid, which looks to have been designed to accept a 213-type 9V battery, as mentioned earlier they're actually supplied complete with 9V/100mA plug pack supplies. These are almost 'overkill' in terms of running them, as both units draw less than 10mA idling, and only 20mA during control pulsing. The DC power cables plug into the rear of the bases via 3mm OD concentric connectors.

A nice feature is that both transponders have a visible LED inside the upper 'eye' section, alongside the IR detector or emitter, to confirm system operation and also assist in setting things up.

Trying it out

Jaycar sent us a sample AR-1805 system to evaluate, and we were able to try it out with both a VCR and a DVD player. We tried it first just between adjoining rooms, and then between one room upstairs and another downstairs. One setup had a range of about 10m, through a single internal wall, and the other a range of about 15m through both a wall and a ceiling/floor.

In each case there were no hassles at all, and the remotes worked just as well as if they were in the same room as the VCR or DVD player. We noticed that the Receiver LED flickered occasionally 'by itself' (presumably due to external interference on the 433MHz band), but this didn't appear to produce any malfunctions — or any response from the equipment, in fact.

We really liked the visible LEDs in both the Transmitter and Receiver units, by the way, because they allow you to line up each unit and check that it's operating. Seeing the Transmitter 'blink' in response to your remote button pressing is also quite reassuring...

Overall, we found the system not only cute and easy to install, but very functional as well. At the quoted price of \$119 it seems a little pricey, although it does provide everything you need — including the two plug pack power supplies.

One little suggestion, though. Without batteries in the base of each transponder, they're a bit light; even the weight of the DC power leads tends to pull them away from where you place them. It would be a good idea to 'weigh them down' by placing a few pieces of metal in what would have been the battery compartments. Don't use a battery, because in time it would leak corrosive chemicals; but a few surplus nuts and bolts in a small plastic bag would probably be fine. ♦

Jaycar AR-1805 RF

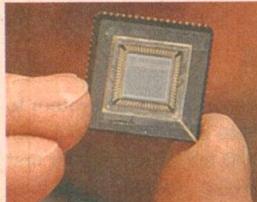
A compact system to allow IR remote control to extend between rooms, using a UHF radio link to avoid cable hassles.

Good Points: Very easy to set up, especially using the visible LEDs. Reliable in operation over typical distances within a home.

Weak Points: Transponders are a little light; weighting the bases helps. The price seems a bit high.

RRP: \$119.00

Available: Jaycar Electronics stores and dealers. Enquiries to (02) 9743 6144 or www.jaycar.com.au, or order direct via 1800 022 888.



Silicon Valley Newsletter.....

Motorola buys General Instruments for US\$11B

MOTOROLA APPARENTLY believes most consumers will choose cable over enhanced phone lines to combine entertainment, the Internet and telecommunications services. In pursuit of becoming a major player in the market for integrated voice, data and video transmissions over cable, the company has agreed to pay US\$10.7 billion for General Instruments.

The largest maker of TV set-top boxes that deliver cable, phone service and Internet access, General Instruments holds 90% of the world market in digital cable boxes and 60% of older analog models. Its nearest competitor is Scientific-Atlanta. GI had US\$1.98 billion in sales last year, compared with Motorola's \$29.4 billion.

In 2000, the number of digital set-top boxes in US homes is predicted to triple to 7.9 million from this year's total. Sales are predicted to reach US\$9.3 billion by 2003.

Following the merger, General Instrument shareholders will own 17% of Motorola. Chief Executive Ed Breen will join Motorola as head of a unit that combines his company with the cable business of Motorola's Internet and networking group.

Motorola is expected to use its chip manufacturing operations to supply General Instruments with support chip ICs. Currently, GI's set-top boxes are built around digital signal processor ICs from Broadcom. That is not likely to change since switching to a different DSP would require a time-consuming redesign of the boxes.

Visor: a new rival for the Palm Pilot

THE MARKET FOR handheld computing devices has welcomed a potentially powerful new contender, as Handspring Inc., the heavily funded Silicon Valley start-up launched its long-awaited 'Visor' system that offers users a cheaper and more expandable hand-held computer than the market-leading Palm Pilot from 3Com (but software compatible with it).

The Visor was designed by Donna Dubinsky and Jeff Hawkins, the same entrepreneurial duo who developed the Palm Pilot, which is already used by some four million people worldwide. Dubinsky and Hawkins left Palm in 1998 to form Handspring.

The Visor lets users plug a variety of pieces

of hardware into a basic unit via a so-called 'springboard' that connects hardware to the Visor. Among the add-ons are adaptors for playing music, making phone calls, taking pictures and playing computer games. One add-on to the Visor is a cartridge that looks like the top of a cellular phone, which combines the two devices by automatically dialing numbers in a user's phone book. The Visor has a built-in microphone and the add-on has an ear piece. A variety of software applications is also available and are loaded into the system from credit-card-size memory cards.

The Visor is about 16mm thick and measures 75 x 125mm. The LCD screen takes up most of the surface. It has 2MB of memory — the same as the base Palm Pilot — and can store about 6000 addresses, five years of appointments, 1500 to-do items, 1500

3Com made its surprise announcement of spinning off the Palm unit less than 24 hours before the Visor launch — taking some attention away from the launch of the new competitor.

While they will compete, there are strong ties between Handspring and the Palm unit beyond their common founders. For one, Handspring is using the Palm operating system and is one of Palm's 'strategic partners'. Palm officials said they welcome the entry of the Visor, which will likely broaden the overall market of handheld devices, a development from which Palm also stands to benefit. "They are doing exactly what we want licensees to do: to take our platform and extend it in different ways", said Alan Kessler, president of Palm Computing. "Handsprint will help drive more success in



Handspring Inc's founders (L to R) Jeff Hawkins, Chairman and Chief Product Officer; Donna Dubinsky, Chief Executive Officer; and Ed Colligan, VP of Development and Marketing. Handspring has just announced a range of lower priced, more expandable products to compete with the Palm Pilot, which they also developed. (Business Wire)

memos and 200 e-mail messages. The Deluxe version has 8MB of memory.

Unlike the Palm Pilot, which has been popular in the business community, the Handspring unit is being directed at the consumer market. Initially the machine will only be available from Handspring's Web site. Next year, the device will be distributed through traditional retail channels.

Well aware of the Visor announcement,

a larger Palm economy by spurring more software and hardware development."

The Visor's base unit will sell for US\$179. A high-end unit will list for \$249 in an upgraded version. By comparison, the newest Palm Pilots cost around \$500.

Some analysts predict Handspring will sell about one million Visors in the next year. By comparison, 3Com sold about 1.6 million Palm devices last year.

Sony invests in TiVo, too

CONSUMERS HAVEN'T BEEN lining up yet to buy TiVo digital television recorders, but corporate interest in the devices is growing as Sony announced a US\$25 million investment in the Sunnyvale company. As expected, Sony said it would also join its long-time Dutch technology partner Philips in manufacturing and marketing the TiVo recorders.

TiVo's 'personal video recorders' are, in essence, high-capacity computer hard drives that let viewers replay a portion of a TV program while the machine continues to record the actual broadcast. Thus, viewers can take a telephone call and put a TV broadcast 'on hold', then afterwards continue to watch it in 'delayed real time'. By quickly skipping over commercials, viewers can also catch up with the real broadcast.

Sony will own 8.8% of TiVo, which has planned an initial public stock offering that is expected to raise at least US\$71.5 million.

TiVo is not alone in the market for PVRs, which cost from US\$500 to \$1500. Silicon Valley company Replay Networks of Mountain View co-developed the technology, and has licensed Matsushita Electronics' Panasonic subsidiary to sell its product.

Sun swallows Star, sends out its Rays...

SUN MICROSYSTEMS HAS taken a shot at the heart of one of Microsoft's most profitable product lines. Following the Mountain View computer maker's acquisition of software firm Star Division of Fremont, Sun announced it would immediately make the StarOffice suite of business applications available for free download from the Internet. The Star Office suite includes word processing, spreadsheet, presentation graphics and several other applications. Microsoft's Office suite starts at around US\$400 and comes in a box of CDs. Unlike Microsoft Office, StarOffice can run not only on Windows but also on the Linux, OS/2 and Sun Solaris operating systems.

Star Division was founded in Germany in 1985 by Marco Boerries, who later moved the company's headquarters to Fremont in Silicon Valley. All 155 Star Division employees have been offered jobs with Sun, and Boerries has become Sun's new VP of Web-based Applications.

Sun claims that a whopping 250,000 people downloaded the 65MB StarOffice during the first week it made the office application suite available for free download from its Web site (www.sun.com/staroffice). Sun CEO McNealy said the heavy demand for the free software shows Sun could succeed in its effort to break Microsoft's stranglehold on the business applications suite market. "This is the way you change the computing model", McNealy said at a conference the following week. ♦

Only days after making the free software available, Sun also unveiled a line of 'Sun Ray' network terminals, aimed to replace Windows-based PCs in computer networks in schools and other institutions. The Sun Rays consist of little more than a monitor and keyboard. Network connection circuitry built into the keyboard allows the system to connect to powerful network servers that store applications and data files. Users only need a credit card-sized access key to use any Sun Ray machine in a given company or school.

Made for Sun by Taiwan's Mitac International, the Sun Rays could hardly be cheaper. Sun plans to sell them for US\$499, but is also planning to lease the machines for just \$9.99 a month. Including the computer servers, software, networking equipment and other components, the machines will cost companies around US\$30/month.

Sun said the new machines are not designed to compete with Windows desktop computers in general-purpose work environments. Rather, they are aimed at specific, large niche markets that evolve around intensive data entry and retrieval such as in banking and libraries. They require a 10Mb/s TCP/IP based network as well as a Sun server computer.

Microsoft nets Visio

MICROSOFT HAS leveraged the power of its half-trillion dollar market value by paying US\$1.3 billion in Microsoft stock for Seattle-based Visio, a leading publisher of technical drawing software.

Visio will become a division within Microsoft's business productivity group, which includes the Office suite of products. The Visio 2000 line of diagramming and drawing software titles will be marketed as a "separate but complementary" addition to the Office suite of programs, according to Microsoft senior VP Bob Muglia.

Solelectron pays US\$2B for Smart Modular

AMERICA'S LARGEST high-tech contract manufacturing company, Solelectron, is branching out into the memory module design and production arena with a US\$2 billion, all-stock takeover of memory chipmaker Smart Modular Technologies.

Solelectron is based in Milpitas in California and does about US\$10 billion a year in contract manufacturing work — mostly board-level assembly for hundreds of computer and electronics companies in Silicon Valley and elsewhere. Smart Modular is located in neighboring Fremont and sold US\$714 million worth of memory modules in 1998. Its main products are memory modules, flash smart cards and embedded high-performance computer modules. Most of Smart Modular's manufacturing was already done by Solelectron. ♦

DTV: A first-hand report

HDTV IS HERE (in America) at last. In May, the first television stations around the United States began broadcasting in high-definition television (HDTV) format. Having written about the 'coming age of digital TV' since the early years of the Bush Administration, I just couldn't resist...

So thanks to my son's best friend, who works in the video department of a local electronics superstore, I now have a 65-inch 16:9 aspect ratio HDTV set plus a set-top receiver box that picks up the signal broadcast from a TV tower in San Francisco 45 miles away. The package, normally selling for around US\$8500, cost \$4500 and that was a good deal by any measure.

\$4500 for a new TV, I hear you exclaim — are you nuts? Yes, I am! (Life gets a lot simpler when you can concede to that...) It is a little much, to be sure, especially since I don't watch much TV. But *Star Trek* in HDTV is awesome!

In Silicon Valley, there are now five local network channels (ABC, CBS, NBC, Fox and UPN) broadcasting in HDTV. Actually, all they are doing is broadcasting regular programming in both 'DTV' (the new popular term) and regular format. The picture quality of these regular TV programs, broadcast over DTV signals, are a remarkable improvement over anything you've ever seen on a large-screen set.

But none of that compares to the stunning quality of a true DTV program, one recorded with the \$100,000+ special digital cameras. The quality is significantly better than even a state-of-the-art movie theatre. So far, only the Jay Leno late night talk show uses DTV cameras. You can literally read the 'Made in China' label on the bottom of Jay's coffee mug. Stunning!

Still, it is obvious that the TV industry has some work ahead before mass adoption of this new broadcast technology is likely. Often the digital image 'stutters', causing it to break up into coarse blocks of digital data — similar to what happens when you have a bad DVD disk. And in the evenings some channels are forced to reduce their signal output power, causing all sorts of undesirable digital distortions, often caused by TV signals bouncing off tall buildings and even cars. Sound also frequently arrives slightly behind the picture.

Paul Swart



New Books

Electronics & music

MUSIC ENGINEERING: The Electronics of Playing and Recording, by Richard Brice. Published by Butterworth-Heinemann (Newnes imprint), 1998. Soft covers, 235 x 157mm, 357 pages with audio CD. ISBN 0-7506-3903-2. RRP \$62.95.

Music and electronics are now very closely intertwined, with electronics used not only inside many of the newer instruments, but also throughout the recording, editing and reproduction of musical performances. Small wonder that many musicians and recordists need to know at least some basic electronics, while electronics technicians and engineers involved in audio also need to know the basics of music.

This book seems to have been written to provide a practical technical reference and guide for anyone involved in the production, recording or reproduction of music, whether they're coming from the 'music' side or the 'electronics' side.

As you might expect from this it's pitched at a fairly basic technical level overall, but with enough maths plugged in here and there to satisfy the more advanced/serious reader. There's also an accompanying audio CD with a total of 55 tracks, illustrating many of the concepts discussed in the book itself.

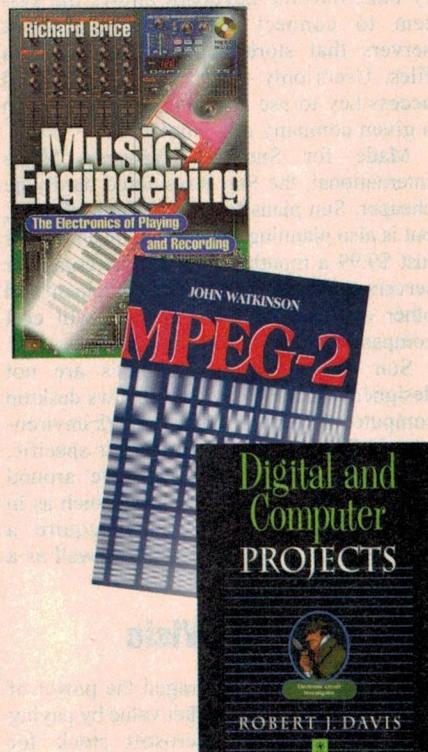
The writing is generally quite accessible, and there's a lot of very useful information presented — so it should make a worthwhile reference book for anyone involved in, or even just interested in, the intersection of electronics and music. However some of the pictures (all B&W) are very dark and poorly printed, while others are so blurred and pixelated that I suspect they're the bitmap headers instead of the correct image files. In a few cases the captions refer to details that are nowhere to be found, too. On the whole, then, the text is let down by poor illustrations.

The review copy came from Butterworth-Heinemann Australia, of P.O. Box 146, Port Melbourne 3207. (J.R.)

Video and broadcast technology

MPEG-2, by John Watkinson, Published by Butterworth-Heinemann (Focal Press imprint). Hardcover, 246 x 189mm, 256 pages. ISBN: 0-240-51510-2 RRP \$95.

MPEG video compression has gained widespread acceptance as the standard form of digital video encoding over recent years, and found its way into everything from internet teleconferencing to DVDs. With this rise in popularity, an accessible work on the gory



details of MPEG compression (incidentally including MPEG Layer III, or MP3 encoding) is sure to be of interest.

This book is aimed at the widest possible readership, providing a detailed explanation of MPEG from first principles, avoiding the usual reams of maths that beset most technical works of this calibre. The author is an international consultant in audio, video and data recording, and is a member of the AES and the British Computer Society.

Touching on subjects as diverse as loudspeaker design, Fourier analysis, digital storage, the idiosyncrasies of the human audio and visual system and the nature of information itself, the book provides a thorough and very lucid introduction to audio and video compression. Through the use of simple, clear diagrams, and some of the clearest technical writing I have come across, Watkinson makes the whole process look remarkably straightforward.

The programmer in me was impatient for some actual algorithms, even some examples of the data structures in use — but none were to be found.

On reflection though, this is only right, as MPEG does not define the encoding process; rather it defines the bitstream that the encoder produces. As such, the author takes the far more interesting approach of explaining the nature of the task at hand, ways in which data can be compressed, and the pit-

falls of the inappropriate use of compression.

The book contains a useful amount of solid information; far more than the average general-interest publication, but it manages not to drown the reader in a mass of obscure acronyms and tables of raw data. The simple, well-presented diagrams complement Watkinson's straightforward style, and help to break up some of the more esoteric concepts for the uninitiated.

All in all, an absorbing read for the curious, and a useful source of hard information for those with a professional interest.

The review copy came from Butterworth-Heinemann Australia, of P.O. Box 146, Port Melbourne 3207. (J.B.C.)

Construction projects

DIGITAL AND COMPUTER PROJECTS, by Robert J. Davis. Published by Butterworth Heinemann, 1999. Soft cover, 178 x 233mm, 208 pages. ISBN 0-7506-7172-6. RRP: \$59.95.

The author of this book is perhaps better known through his articles for the US magazine *Nuts & Volts*. This book includes a number of the author's magazine projects along with a few more that have not previously been published.

The projects include various EPROM copiers; several adaptors including a video/printer port device; quiz machines; a digital storage oscilloscope; an audio mixer and several monitor projects such as a VGA adaptor and converting old computer monitors to 31kHz operation. In fact there are some 45 projects, grouped under the headings of digital projects, printer port projects and monitor projects.

The digital projects are not computer dependent, although some of the projects (eg. the power on self-test card) are for a computer. There are four EPROM copier circuits in this section, but don't expect anything very complex — these are simple circuits that simply copy one EPROM to another. And to amuse the kiddies, there are six different quiz machine circuits, each with different features. These projects are mostly intended to be built on wire-wrap board.

The printer port projects are designed to work from a standard parallel port, and include two digital oscilloscope circuits (one with a PCB design). Software listings are given in the book, but these run to several pages. It would be nice if the author offered these from a website.

There should be something for nearly everyone in this book, and none of the circuits require expensive parts. The review copy came from Butterworth Heinemann, PO Box 146, Port Melbourne 3207. (P.P.)♦



Powertech 500VA Slide Regulator

A recent addition to Jaycar's extensive product range is the Powertech SRV-5, a variable autotransformer with a built-in output meter and a rating of 500VA. It's compact and reasonably priced, too.

by Jim Rowe

SLIDE REGULATORS, VARIACS, variable autotransformers — call them what you will, but they're extremely handy devices. For decades they were used mainly in research labs, as a convenient way to provide smoothly adjustable AC for experiments and circuitry under development. But then they were discovered by the servicing industry, which found they were an ideal way to vary the mains voltage to equipment with troublesome intermittent and voltage-sensitive faults...

Ever since then, variacs have been just as popular in service workshops as they ever were in research labs. And many service techs will tell you that along with a scope, they wouldn't even attempt servicing a lot of modern TVs, VCRs and other gear without one.

Basically a variac is nothing more than a variable autotransformer, of course. It has a single winding on a laminated iron core, usually toroidal in shape and with the insulation removed from each turn for a short distance at one end. A rotor driven by the control knob moves a small carbon brush over the exposed turns, so it forms a 'sliding tap'.

If the 240V mains is connected between the two ends, the rotor can therefore be used to select virtually any desired output voltage between 0 and 240V. And if the 240V is connected between one end and a fixed tap about 8% from the other end, the rotor can be used to deliver *more* than the 240V input by turning it past the fixed tap (so the transformer steps up the voltage rather than stepping it down).

Jaycar's Powertech SRV-5 uses this fixed tap scheme, and therefore provides a nominal output voltage range of 0 - 260V, for an input of 240V. It's rated at 500VA, so it will comfortably deliver up to 2A — more than enough for the vast majority of servicing and development lab applications.

Like many of the better variacs it also provides a small meter to give you an indication of the output voltage. It's a fairly small meter, with a visible face 43 x 24mm and a 0 - 300V scale only about 27mm long, but this is generally all you need anyway. (If you need to set the output voltage really accurately with any variac, you normally use a DMM.)

Along with the meter the SRV-5 also provides a rocker-type mains switch (illuminat-

ed), a cartridge fuseholder and a standard three-pin socket for the output. All of this fits in a compact but sturdy 'traditional variac' type metal case with the large output control knob at the top, measuring 175 x 165 x 125mm overall and weighing about 4kg. It's fitted with a standard 3-pin mains cord and plug, and the metal case is securely connected to mains earth.

What we found

Jaycar Electronics made a sample of the SRV-5 available for us to evaluate, and our tests gave some impressive results. For an input voltage very close to 240V we measured minimum and maximum RMS outputs of 6.2V and 259.7V respectively, for example — well within the usual tolerances.

There was virtually no measurable leakage from active wiring to the earthed case either, meaning that it should be as safe as any variac or autotransformer can be. (There is of course no isolation between input and output, with this type of device.)

The resolution and accuracy of the internal meter turned out to be fine, with errors much less than the needle width above 100V, and

Product Review

only really discernable (i.e., about one needle width) at 50V and below. This should be quite acceptable for all likely applications.

The load regulation was also quite good, even at maximum output. Output droop measured only -1% (2.6V) at 375W loading, and even when we applied a 600W load briefly, it fell by only -2.25% (5.8V).

Overall, then, we found the Powertech SRV-5 Variac a well-made unit and one that seems to deliver all the performance likely to be needed by the majority of service workshop and lab users. At the quoted price of \$189.50 it seems very good value for money. ♦

Powertech SRV-5 Variac

A compact 0 - 260V variac for servicing and lab work, rated at 500VA and with a built-in output voltage meter and 3-pin output socket.

Good Points: Although small, the output meter was quite accurate. Output was easy to adjust and load regulation was good.

Weak Points: Nothing significant.

RRP: \$189.50.

Available: Jaycar Electronics stores and dealers, or visit their website at www.jaycar.com.au.

SuperCRIMP

When it comes to crimping tools, it really is a case of the bigger the better. The longer and sturdier the handles and jaws, the more force you can apply to the connector you want to crimp. If you've used one of those tin-plate crimpers that come with 101 spade lugs from your local hardware store, you'll know that they're only good for about three of four crimps before they start falling apart. Probably just as well, actually, because your hands will only be up to three or four crimps before they start falling apart too...

The rather aptly named 'Supercrimp' from Jaycar must be the biggest and most impressive crimping tool we've ever seen, and its performance is superb. Its four-pivot design gives you an 8:1 mechanical advantage, and it has big thick comfortable handles that mean that you can squeeze to your heart's content without hurting yourself.

To make your life even easier, the Supercrimp has an adjustable ratchet that lets you release your grip halfway through a crimp, get a better purchase on the handles, and start squeezing again. There's also a ratchet release lever just in case you've bitten off more than you can chew - although you'd be hard pressed to find anything these crimpers couldn't handle.



**You'll be
munching
everything in sight
with these heavy duty
crimpers - The teeth can
be replaced with five other
sets to handle just about any job.**

for RG59 and RG6, as well as a set to suit the common insulated crimp terminals.

I'll go all out here and thoroughly recommend the Supercrimp - it is one of the most professional and well made tools I've seen, and it will last a lifetime. The price is trivial when compared with the quality, and the removable dies mean that it is up to any crimping job you could throw at it.

Supercrimp (Cat #TH1950)

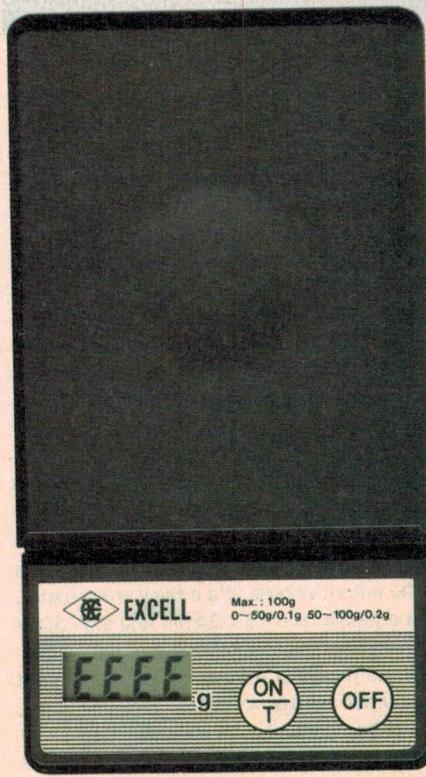
\$59.95 All Jaycar stores

Mini Scale

Most digital scales offer a resolution of 1g, which is fine if you are working up in the hundreds of grams, or kilos. If, however, you are working with small amounts, say 20g, a one gram resolution translates to a 5% error — quite significant in some cases. This set of mini digital scales from Jaycar can accurately weigh down to 100mg (0.1g), and they are dead cute. To give you an idea of 1mg, you're looking at the weight of a standard dressmaker's pin. A BC547 weighs in at 200mg, while a beefy aspirin averages around 500mg, or half a gram.

The scales can handle a maximum weight of 100g, with the resolution falling to 200mg once you exceed 50g. With such a

Ever weighed a pin? Weigh away on these micro scales, with a resolution of just 100mg. They can handle up to 100g, and turn themselves off when you've finished. Clever, eh?



high resolution, these scales are well suited to counting components. At 200mg per transistor, you could count 500 at a time with an error of +/- one transistor, or count 250 with no error at all.

You can check kits to see if a component has been left out, accurately determine the weight of your tone arm (assuming you still have a turntable), or even measure out little bags of white powder - but we won't dwell on that...

Operation is as simple as hitting the 'On' button to start, and the 'Off' button when you've finished, and these also a tare/nett weight function to cancel the weight of any packaging or container. You can also calibrate the scales with the front panel controls and a 100g weight, although the scales come already calibrated in Australia and won't really need re-calibrating unless they are dropped or otherwise abused.

All up, they are a very accurate, high resolution scale. We couldn't come up with all that many uses for them, but if you need this level of accuracy, these are about the best you'll get.

Mini Digital Scale (Cat #QM-7248)

\$199 All Jaycar stores

NEW PRODUCTS

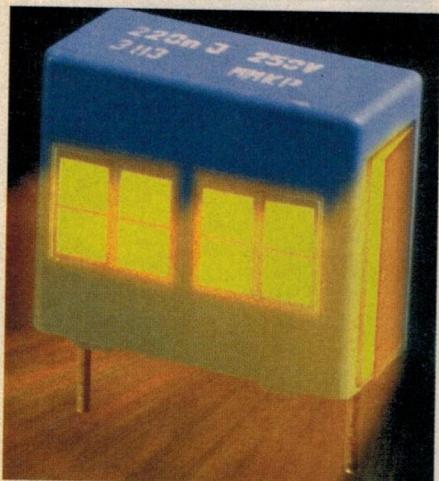
Components & Equipment

High performance film capacitors

With the addition of the new MMKP 383 Series film capacitors, BC Components offers a full range of AC and pulse film capacitors for uses such as lighting, power supplies, TV/monitor and automotive applications. Market trends towards miniaturisation and high frequency/high pulse load applications are addressed through the double metallized electrode design, boxed layout and the use of polypropylene material.

The boxed layout means that the 383 Series has a low profile for lighting ballast design. The polypropylene construction allows for HF use in, for example, resonance circuits, while the multi-section construction enables high voltage use (up to 2500V DC or 900V AC).

Electronic ballasts, HID (high intensity discharge) lighting and switch-mode power supplies are among the typical applications for this new range. The 383 Series offers a highly reliable and all round cost-effective solution with the required pulsed load performance, small case size



and a bent-back pitch on tape, so that body sizes up to 17.5mm can be automatically inserted, achieving significant cost savings for manufacturers.

For more information contact BC Components in the Netherlands on +31 40 2590 724, or visit their website (www.bccomponents.com).

Quad image video processor

Now available from Allthings Sales & Services is a very competitively priced high-resolution Quad Screen Digital Processor, the Quad-BW 711, for closed circuit television surveillance applications. The compact unit accepts composite video signals from four video surveillance cameras or other video sources, then digitally constructs a single screen quad image for output to a monitor and/or VCR.

Resolution is better than S-VHS at 720 x 576 pixels and A/D sampling is 8 bits, providing a grey scale resolution of 256 levels. An inbuilt generator stamps the quad image with Time, Day and Month.



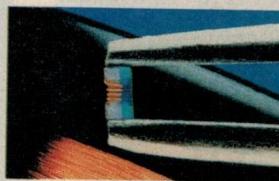
The unit also has a VCR video input with Front-Panel selector, which allows instant review of a recording without the need to swap the monitor cable between the processor and VCR.

The unit requires a 500mA 12V DC supply. If the optional mains Plug Pack is purchased with it, the warranty is extended from 12 to 15 months.

The Quad-BW 711 is priced from just \$284.00 including tax.

WHEN small IS BIG NEWS

Introducing the world's first 0402 wirewound inductor



Coilcraft's new 0402CS Series is the latest breakthrough from the company that was also the first to introduce 0603 and 0805 wirewound chip inductors.

These parts measure just .047" x .025" x .024" high (1.19 x 0.64 x 0.61 mm). Their top is encapsulated to provide a smooth surface for reliable pick and place handling. Twenty one part numbers cover the inductance range from 1 to 40 nH with available tolerances of + 5% or 10%.

The performance of Coilcraft's wirewound 0402 inductors significantly surpasses that of non-wirewound alternatives. For example, a 2.2 nH Coilcraft part has a Q factor of 100 at 1.8 GHz while 43 is the highest Q published by competitors at the same frequency. Because of their low DC resistance, Coilcraft chips can handle 200% to 300% more current than non-wirewound 0402 inductors.

Coilcraft



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Compact 60W converters

The latest 48V/60V input DC/DC power modules from Ericsson Energy Systems extend the 60W PKG family with models aimed respectively at low voltage digital and broader analog applications. All PKG models deliver full power without needing a heatsink, and withstand case temperatures up to 100°C.

Weighing only 75g, the PKG 4319 PI provides a 2.5V 15A output, while the PKG 4625 PI offers dual 15V outputs, with either output capable of sourcing up to 3.2A within an overall total output of 60W. Both models feature rugged mechanical construction and automatic assembly on a ceramic substrate, which together contribute to an MTBF greater than 200 years.

A full set of protection and control facilities are included as standard, simplifying the use of these isolated output converters in sophisticated distributed power for IT and telecommunications systems.

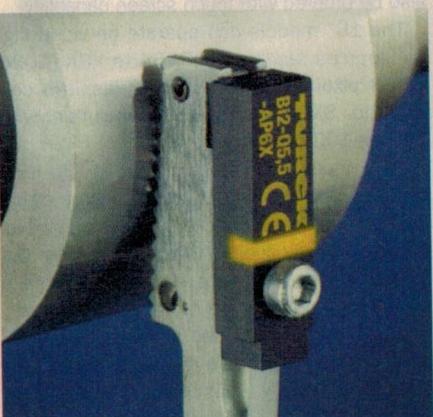
Advanced thermal design and proprietary topology enables the PKG 4625 PI to maintain 86% efficiency from 25 to 60W output, with the 2.5V PKG 4319 PI delivering 78% efficiency from 20% to 100% of full load. Both modules are designed for parallel operation in applications requiring even higher power, and include overcurrent and short circuit protection to simplify system design.

For more information visit Ericsson's website at www.ericsson.com/energy.

Tiny proximity detectors

Turck Inc. has announced the Q5.5 proximity sensor, a tiny rectangular sensor featuring an advanced design including a novel LED light bar visible from three sides to provide mounting versatility; the LED indicates 'Output Energised'.

The Q5.5 will fit near or inside machinery where standard sensors are too large to incorporate, and provides superior range characteristics. It is claimed ideal for solving origin and end-limit detection, robot chuck position, cam detection, linear guide motion, and other applications where space is limited.



Created with a new injection-mold process that provides superior sealing, the waterproof housing of the Q5.5 measures just 5.5 x 3.0 x 28.0mm. The sensors provide 2mm sensing range and are fully embeddable in steel.

The three-wire, 10-30V DC Q5.5 sensor provides repeatability <2% of rated operating distance, and is available with normally open NPN (sinking) or PNP (sourcing) complementary outputs. Integral circuitry protects it from short-circuit, overload, wire-break and reverse polarity.

For more information contact Micromax, 307 Keira Street, Wollongong 2500.

Automated machine vision

A new automated inspection system which can be programmed by users and does not require a PC to operate it, is now available from Auckland-based machine vision specialist Industrial Vision Solutions (IVS).

CAMAT is the latest offering from one of IVS's partners, Vision & Control GmbH in Germany, and was a joint development between Vision and Control and another



German company FiberVision GmbH. Unlike other smart camera systems which require a PC to program them, the new system is a completely standalone unit. All programming of the camera software can be done by the user using a hand-held keypad with the menu options on a monitor attached to the camera.

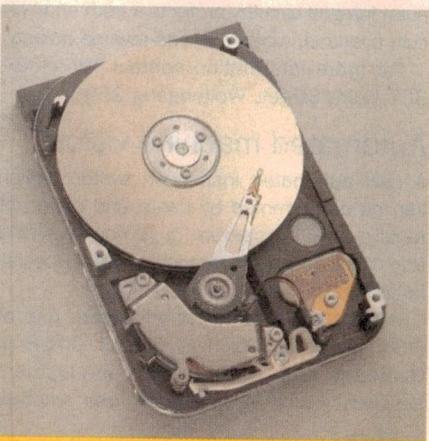
Using commands selected from menus shown on the video display, programs can be edited, saved internally and run manually or in response to external triggers. No other software is required, with a smart camera completing the system.

CAMAT is designed for simple inspection tasks on a production line, such as repetitive measurements, checking labels, surface finishes and completeness. One unit costs around \$7000 which includes the smart camera, keypad and monitor.

For more information contact Industrial Vision Solutions, Auckland NZ; phone 0800 487 487 (NZ) or 1800 553 531 (Australia). ♦

COMPUTER NEWS

& New Products



Disk drives for sub-\$1200 PCs

Seagate Technology Inc has extended its leadership in disk drives optimized for low-cost computing devices, with the introduction of its third generation of 'U-series' drives, claimed as the world's first family designed specifically for use in entry-level home and business computers as well as home electronics.

The new U8 models extend the series by doubling capacity to as much as 17.2GB and significantly improving performance. The U8 includes the latest in drive component technology, including GMR heads, Seagate G-Force Protection and the Ultra ATA/66 interface, delivering greater value to sub-\$1200 PCs.

Graham Penn, Director Storage Research, IDC Asia/Pacific, stated that new generation drives such as Seagate's U8 are addressing critical cost issues for low-cost computing environments. "U8 technology also opens the disk drive 'door' to consumer electronic devices. This adoption of disc drives as core recording devices marks a key emerging market in consumer electronics", said Mr Penn.

Disc drive-based home recorders are able to record and play back multiple streams of information simultaneously. Such streams can include television programming, music video games, and Internet content.

The U8 drives will be available with capacities of 17.2, 13.0, 8.4 and 4.3GB. For more information contact Seagate's Asia Pacific Sales & Marketing, 151 Lorong Chuan, New Tech Park #06-01, Singapore 556741.

Hi-res active matrix LCD displays

The Conrac 5000 series of lightweight, active matrix LCD flat panel monitors are now available from Thomas Electronics. Available in a range of sizes from 15" to 20", these high resolution LCD monitors are claimed ideal for industrial and military/marine applications.

Being flat panels, these displays have active screen areas that are much larger than equivalent sized CRT monitors. The 15" model has a screen size that is comparable to a 17" CRT monitor, while the 18.1" and 20" models have a larger viewing size than 19" and 21" CRTs, respectively.

Exhibiting high magnetic field immunity, the new monitors are available in industrial and ruggedised versions.

These displays offer monitor-like signal and multi-sync



capabilities

and come in rugged rack mount or cabinet models. They can also be ordered with touch screen capability.

The 15" models can operate on video signal sources ranging from VGA to XGA (1024 x 768 pixels), while the larger displays can work to SXGA workstation resolution with 1280 x 1024 pixels.

BNC input connectors, input black level clamping and signal level control ensure signal fidelity when operated on long cables and exhibit high immunity against EMI disturbances. On-screen-display and a front panel keyboard make adjustment of the display parameters easy.

Other features include automatic recognition of the signal source applied to the analog input, low energy consumption, flicker free image, intelligent power management, perfect

linearity and convergence and low emission.

For more information contact Thomas Electronics of Australia, 3 Sheridan Close, Milperra 2214.

LabVIEW for Linux

National Instruments has announced that LabVIEW software, the world's leading development environment for computer-based measurement and automation application, is now available for Linux operating systems. Researchers and developers using Linux in academia and industry can now take advantage of LabVIEW and the benefits that it delivers to the development of measurement and automation applications, including ease-of-use, reduced development time and increased productivity. National Instruments is the first company to produce an application development environment for computer-based measurement and automation with Linux.

LabVIEW 5.0.1 for Linux/x86 contains many of the features that have made LabVIEW the most popular application development environment used by engineers and scientists, including an intuitive graphical user interface, compiled source code, true multitasking, serial I/O, TCP/IP networking, virtual memory and more.

The Linux Lab Project, staffed by independent users, has been providing general Linux data acquisition and process control drivers and libraries for many of National Instruments general-purpose interface bus and data acquisition modules. LabVIEW's open architecture makes it easy to call any of these drivers for I/O purposes.

For more information contact National Instruments, PO Box 466, Ringwood 3134.

Handheld computer includes IR modem

Ericsson Australia has released its latest mobile communications device, the MC 218,

for those whose mobile communications requirements go beyond the spoken word. The ergonomically designed Ericsson MC 218 is the perfect companion for today's road warrior.

Supporting e-mail, fax, and SMS messages, the MC 218 mobile companion also includes an Ericsson DI 27 infra-red modem for seamless connectivity to the GSM cellular network. In addition, Wireless Application Protocol (WAP) functionality provides fast and easy access to the Internet via the MC 218 anywhere, anytime, because WAP uses a programming language called Wireless Markup Language (WML) to speed up connection to online information for mobile devices.

The Ericsson MC 218 operates on the EPOC operating system, which has been developed jointly by the Symbian group specifically for mobile devices. The system is easy to operate, fast, efficient and versatile, and offers a fully featured suite of personal information management, productivity, and communication applications.

The MC 218 and DI 27 are compatible with the complete 600, 700, and 800 series of Ericsson mobile phones as well as the new T18s and A1018s.

More information is available from the Ericsson web site (www.ericsson-mobiles.com.au).

PC speakers from Logitech

Logitech has announced a new generation of speakers for the rapidly growing multimedia sound market. The enhanced SoundMan line incorporates excellent sound reproduction, made possible through Linear Magnetic Drive (LIMAD) technology, in an attractive, contemporary industrial design that requires minimal space and provides 'must-have' appeal at a competitive price.

The SoundMan X1, a high-performance subwoofer and speaker system marks the launch of the new Logitech audio line, with additional models following during the rest of the year. The system is claimed to bring theatre-quality sound to MP3, DVD, CD music, gaming and other popular multimedia applications. The expertly tuned subwoofer accurately reproduces the full bass range and combines with two satellite speakers to provide a total of 25 watts of RMS power capability. The small footprint enables users to easily place the speakers on a desk, bookcase, or in an entertainment center.

The carefully thought-out design offers convenience features including headphone jack



and sound controls, an integrated power supply that eliminates the need for an external adaptor and an automatic sound detection system that activates the speakers and subwoofer only when sound is present.

With an RRP of \$149, SoundMan X1 is bundled with the MP3 Music Center CD-ROM containing more than 100 MP3 songs and Internet music software, developed for Logitech by AudioSoft. The MP3 Music Center allows users to download and play music from the Internet.

For more information contact Logitech Australia, Level 2, 633 Pittwater Road, Dee Why 2099.

A3 colour printer offers 600dpi quality

Canon has announced the Canon CP660, a 600 dpi, A3 colour printer with 256 gradations of colour/grey scale and offering sharp, high quality colour output at 6ppm or economic black and white output at 24ppm.

Designed for use in medium sized corporate work-groups, the CP660 is a cost effective solution both for colour printing of business documents and for use as a fast black and white network printer solution. It uses a new process for transferring the image to the paper, involving an intermediate transfer drum and a straight, flat paper path. The paper requires one 'flat' pass only for transfer of the total colour image, minimising the risk of paper jams from multiple passes round a drum and enabling the use of thicker, less flexible media such as thick paper,

transparencies, envelopes and glossy film.

Innovative oil-less toner fixing technology involving microscopic beads of wax for the fusing process and newly developed spherical toner particles ensure smoother edges for dramatically sharper and brighter, natural quality, low sheen images without graininess, particularly appropriate for business documents and for clean, clear OHP output.

New print engine and image fusing technologies also enable optional double sided (duplex) A3 full colour printing, providing more professional final documents and more economic paper usage. An optional reader/scanner unit transforms the CP660 printer into a multifunction full colour copier/printer solution.

For more information call Canon's customer enquiry line on (02) 9805 2000.

Iomega's Zip 250 has USB support

It's thin, curvaceous, and holds 250MB of data. It's Iomega's new Zip 250 drive, and to make it even more appealing it comes with a USB interface, and is backward compatible with standard 100MB Zip disks. With its slim lines and USB power supply, the Zip 250 is one of the lightest high-capacity portable drives on the market, and is compatible with both Macs and PCs.

Of course the words 'light', 'thin' and 'portable' will immediately attract laptop and note-



book users, and with the Zip 250's optional PCMCIA connection cable, it can be used with just about any computer system, of just about any size.

The Zip 250MB USB drive is available at an RRP of US\$419, with Zip 250 disks available at around US\$39 each. The Zip 250MB USB drive includes one Zip 250MB disk, a USB cable power supply, a USB guideline sheet, a USB "Quick Start" and a 5-Quick Step guide. ♦

BY GRAHAM CATTLEY

http://www.v.com.au

Webwatch

Due to popular request, I've collated a list of all the sites ever covered in Webwatch, and it is available for download from our web site in the Internet files section. You can save the file on your own system, and use it as a handy reference, and download the update every month. And if you know of any sites that you feel deserve a mention in Webwatch, drop me a line at gcatley@fpc.com.au, and I'll be happy to include them in an upcoming column.

A COUPLE OF months ago, I added a Tech Q&A discussion forum to the EA website, with the idea that people would ask questions, answer questions, or just follow the path of an existing discussion and add their own comments or suggestions. This proved to be more far popular than I had imagined, and the forum has turned out to be great place to post any question you may have that relates to electronics.

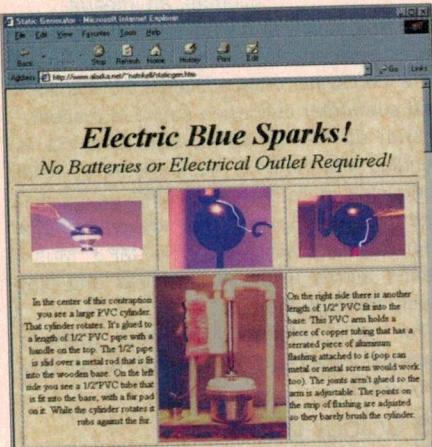
What do you do though, if you have a question that *doesn't* relate to electronics? Well, you could do a lot worse than to try www.eng-tips.com, where they hold a huge number of discussion groups on just about every aspect of engineering.

These are grouped into 27 broad areas, including aerospace, chemical, computer, electrical, electronic, marine, nuclear and so on. You simply register (a painless process) and you then have full access to all the discussion areas you want. It's fun, and very interesting to browse through the hundred or so areas reading and perhaps answering the multitude of questions, queries, and requests. If you have some time to spare when you are next on the web, then register and explore this site — it'll be worth it.

The screenshot shows the homepage of Robohoo!, a directory of robotics links. The main title 'ROBOHOO!' is prominently displayed. Below it are several categories and search functions. The left sidebar includes links for 'Advertisers on Robohoo!', 'Companies', 'Competitions', 'FAQs', 'Hardware Resources', 'Individuals', and 'Feedback'. The right sidebar features 'Link to Robohoo!', 'Miscellaneous', 'Robotics News', 'Organizations', 'Site of the Month', 'Software Resources', and 'Universities and Institutes'. The central content area displays a search bar and a list of robotics-related links.

ROBOTICS SITES are always a popular item in Webwatch, probably because robotics is such a diverse field, and there are a huge number of robot-related sites out there. One site that attempts to bring all these sites together is Robohoo (www.robohoo.com) who boast of over 1000 robotics links on their site. This isn't just a laundry list of sites though, as they've grouped everything appropriately, and it's reasonably easy to find the sort of

thing you're looking for. They also list clubs, societies, and university departments where robotics research is taking place. You'll also find (regularly updated) news on robotics and other related subjects, and a list of top 10 robotics books from Amazon.com. All up, a good site to add to your favorites — assuming you're interested in robotics, that is...



ELECTRIC BLUE SPARKS is what it says, and electric blue sparks is what you'll get if you follow all the instructions at www.alaska.net/~natnkell/staticgen.htm.

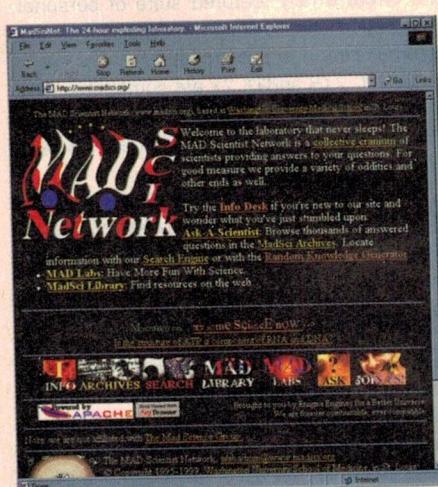
Here you'll find detailed instructions on how to build your own static electricity generator, using only bits of PVC pipe and aluminium cans. There are lots of pictures, and helpful text on building it, so you really can't go wrong. If the design looks a little elaborate for you, you can try the 'PVC and paper towel' method, or even easier, the "I have to make big sparks and the science fair is tomorrow" Ridiculously Simple Electrophorus. There are links to other static electricity pages, explanations of Layden jars, info on the differences various materials will have on the size of the spark, and so on. Who knows? If you build one, you might be able to invite the neighbours round to form part of a human discharge chain. Or perhaps not.

WE SEEM to be running on a theme in this month Webwatch: discussion forums. The next site on my list is the rather strange MadSci Network — the 24-hour exploding laboratory at www.madsci.org.

Here you can ask questions or view previously answered questions, and search through their extensive archives for information.

One particularly attractive interface for the question and answer archive is the Random Knowledge Generator: it... Well, it's sort of, um... Look, you are just going to have to take a look for yourself, I can't explain it. Sorry. The questions aren't answered by the general public, but rather by hundreds of scientists world wide, who are happy to tackle just about anything you can throw at them.

As well, this site is the home of the 'MAD Labs' which among other things features the Edible/Inedible Experiments Archive and A Guided Tour of the Visible Human — perhaps not one for the squeamish...



WHY IS THE SKY dark at night? A simple enough question you might think, but the generally accepted answer is quite interesting. It is made even more interesting by the explanation given at www.arachnoid.com/sky/index.htm, where you'll find a very nice set of interactive Java applets that explain the problem, and one possible answer.

The site is the home of the rather natty (and free!) Arachnophilia website editor, and these pages really show off the capabilities of the software, as does the home page with its dynamic indexing system. Once you've marveled at all this, dig around the site and find the Interactive Gravity Modeler — this is great fun to play with, and you'll learn about orbiting bodies too. ♦

NEW SUPER LOW PRICE + LASER AUTOMATIC LASER LIGHT SHOW KIT: MKII. Automatically changes every 5 - 60 secs. Countless great displays from single to multiple flowers, collapsing circles, rotating single and multiple ellipses, stars, etc. Easy mirror alignment with "Allen Key". Kit inc. PCB, all on board components, three small DC motors, mirrors, precision adjustable mirror mounts:



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Kit with laser module \$60
Kit + laser module + plug-pack + instrument style case all at a special price of \$75

12V Automotive Relays

with 30A SPDT Contacts (73 ohm relay coil). RRP \$7. our price \$4 ea. 4 for \$12

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Small Cheap plastic speakers that don't sound like small cheap plastic speakers. Philips brand.



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Req. 4 X AA

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KEY-CHAIN LASER POINTER
in a presentation box. Quality metal housing + 3X LR44 /AG13 bats. **FREE!**
Extra bats. 50c Ea. **\$10**
Line lens+\$0.80...X-hair lens
+\$0.80...Module (no case) only \$8

16 X 2 LINE LCD CHARACTER DISPLAY
+ 1M IDC ext. cable, LED, buzzer & switch on a PCB.
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TWO MOTOR LASER LIGHTSHOW KIT
Inc. motors, mirrors, reversing switch & all electronic components. Can be controlled by variable DC input. Lots of patterns, flowers, stars etc. \$16 **Laser module \$8**

USED AUSSIE MADE TRANSFORMER
240V PRIMARY (120+120), ES screen, Secondary....1X12V@1.1A...10V@5A...7V@5A... 12-0-12V@7.5A. 100 X 115 X 100mm. bargain at \$15

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Oatley Electronics Shop Open Fridays 1pm-4:30pm & Saturdays 10am-4pm during Sep. & Oct. as a trial. On sale will be surplus & special sale items only. All regular advertised, catalogue stock & kits must be ordered in advance by Phone, Fax or E-mail & can be paid for & picked up at the shop.

200A RADIO CONTROL MODEL SPEED CONTROL KIT

This kit is designed to work direct from a STD 1-2ms pulse from a R/C receiver to control an electric motor (in one direction only). Kit includes PCB + all on-board components inc. 5 high power MOS-FETs, a wiring kit and fuse holder & 26 x 64 x 38mm case. Features include brake. Don't pay \$150 for commercially available one Coming soon for less than \$35

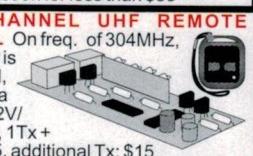


12V SOLAR REGULATOR KIT

Our new regulator suits up to 100W panels. Features a current limiter so it can be used with car battery chargers, generators etc. Low cost due to the use of some unused recycled components. complete kit inc. case \$29... See our bargain solar panels in this ad...

TWO CHANNEL UHF REMOTE CONTROL

On freq. of 304MHz, transmitter is assembled, receiver is a kit, inc. 2 12V/12A relays, 1Tx + 1Rx kit:\$45, additional Tx: \$15



LOW SPEED CRO / CHART RECORDER

Ref EA Aug. 96. Kit Connects to your PC parallel port & samples over 0-2V & 0-20V. Samples can be taken from 1 per hour to 1per 100uS. Ideal to monitor battery charging. It can also be used as a basic low frequency (to about 5KHz) oscilloscope! Our kit includes all onboard components, PCB, box & software on 3.5 disk:(K90) \$25

CLOCK WITH CALENDAR AND TIMER

12V DC 12hr. clock for automotive / domestic/timer use, large (13mm) Green LED display, AM-PM indicator, Date, Month, 24hr. Alarm, 59 Min. sleep timer, back up bat. Xtal 50Hz (20ms) clock can also be used for CRO calibration & inverters. Switch a load with Alarm/timer, 0.5A load directly or 10A with additional MOSFET. Alarm piezo + PCB and all comp's kit: \$14



CAMCORDER AND ACCESSORIES
NiCad. BATTERIES 6V 2400mAh. Multi-fit type. These are new and in original pack. Two types. One type (sbc5223) fits CANON, BAUER and equivalent. The other (sbc5225) fits HITACHI, SABA, MINOLTA, RCA and equivalents. Just a fraction of the retail price at \$30

LEDs, FLASHING LEDs & PHOTO TRANSISTORS (NOTE: When buying LEDs that most STANDARD LEDs are only 1mC or less!!)

3mm 3000 mC - YELLOW: 10 for \$5. 300 mC - GREEN: 10 for \$3. 1400 mC - RED 10 for \$6. Photo Transistor: 10 for \$5

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5mm FLASHING 3000 mC - YELLOW: 10 for \$10. 60 mC - GREEN: 10 for \$10. 300 mC - RED 10 for \$10

10mm 3000 mC - RED: 10 for \$12

10mm FLASHING 400 mC - GREEN: 10 for \$12. 3000 mC - YELLOW: 10 for \$12

5mm IR 850mM 10 x brighter than 880mM emit some visible red \$1.30 Ea. 10 for \$10

OPTO DEVICE BAG OVER100 Pcs.

Contains...LEDs, detectors and IR devices. inc devices to build an IR remote tester A steal at \$10 per bag.

WE HAVE FRESH STOCKS OF NEW 12V/7Ah GEL BATTERIES

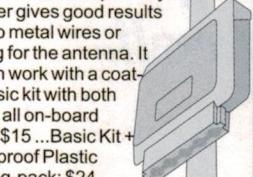
Priced at a fraction of their real value. 65mm (W) X 150mm (L) X 94mm (H),+ suitable trickle charger.



MASTHEAD AMPLIFIER KIT SPECIAL

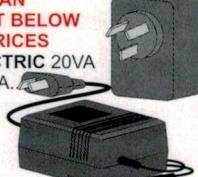
The MAR-6 available separately \$4. The amplifier gives good results with any two metal wires or strips acting for the antenna. It should even work with a coat-hanger! Basic kit with both the PCBs & all on-board parts (K03) \$15...Basic Kit + 2 Weather-proof Plastic Boxes + plug-pack: \$24

(ask for your free case with this item)



NEW AUSTRALIAN PLUG PACKS AT BELOW WHOLESALE PRICES

GENERAL ELECTRIC 20VA
14VDC @ 700mA.



AUDIOVOX 9V
@ 500mA



AUDIOVOX 12V
@ 400mA....



\$5 Ea. or 5 for \$20

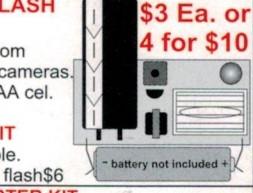
8 CHANNEL IR REMOTE CONTROL KIT

USES: Uses a Magnavox remote control box & 8 keys, & replace the existing Tx PCB. The RX uses an IR RX module @ 38KHz. The output of this simply feeds the matching SM5032B decoding IC. There are 8 outputs, 2 toggling & 6 momentary. To convert the TTL outputs to drive a relay. (K65D) Dual Relay Kit below. Transmitter PCB: 89 x 30mm. RX PCB: 48 x 34mm: Tx Kit (K65T) \$20 Rx Kit: (K65R) \$20

VOLUME CONTROL KIT: With the above Tx and Rx kits you can add a motorised pot / volume control to anything (K65V) \$16 This kit can also be purchased with the above two kits, an RCA & suitable Plugpack: (K65C) \$55

DUAL RELAYS KIT: With the above Tx & Rx kits you can control 2 relays to be momentary or latching: (K65D) \$8

XENON FLASH TUBES
Removed from disposable cameras. Just add a AA cel.



STROBE KIT
also available.

uses above flash\$6

CFL INVERTER KIT

our very popular inverter. The improved design uses a larger transformer and a SG3525 switch Mode Chip. This very Efficient Driver kit can drive a number of CFL's from 12vdc. & would be great for lighting the weekend or caravan Kit inc. 1 inverter & 1 CFL: \$35 Extra CFLs \$13



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Could be used for cooling overclocked PC CPUs. All 40 X 40mm.
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Comes with info to build cooler / heater plus data. Some used heatsinks avail.

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BRAND NEW PACKARD BELL KEYBOARDS. Top quality Packard Bell computer keyboards for just \$12 Ea.

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SOLAR PANELS ARE BACK

Quality SEIMENS brand Polycrystalline cells. Voc Isc 1W output. 4 panels req. to charge 12V batteries. Specifications: Open circuit voltage: 5.7v...Short circuit current: 0.22A Peak Power: 1.0W @ 100Wm/sq cm...

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NEW

PANAFLOW
brand 60mm
12VDC FANS.

\$3 Ea OR 4 FOR \$10
coming soon

UHF AUDIO / VIDEO TRANSMITTER KIT

Kit includes all components needed..... PCB plus all on-board components, connectors, switch, metal case, telescopic antenna, twin RCA A/V lead, all that is needed to complete the full. kit. 12Vdc @ 10mA operation.

Ideal for transmitting audio and video around you home.. Complete Kit for just \$28

VIDEO CAMERAS HOUSED CAMERAS

CMOS DOME COLOUR \$160
CMOS COLOUR IN A SWIVEL CASE \$160

PCB CAMERAS

B/W CCD CAMERAS \$89 pinhole (60deg.), 92 deg, 120 deg. add \$10 for 150 deg.

CCD COLOUR \$190

SUGAR CUBE CAMERAS \$70

ALL WITH A FREE VHF MODULATOR & SUITABLE PLUG PACK



MODEM MADNESS
Why buy a fast modem when it is rare to log on at the maximum speed. We have 28.2 modems that come with a free CD rom / free 30 hour internet connection required. (not supplied)

20-30 SECOND SOUND / VOICE RECORDER KIT.

This kit could be used to take messages at your door or as a personal reminder device & is easy to assemble. Good quality sound at 25 sec. Uses LS1 chip with memory etc. all built in. Kit inc. PCB, all on-board components, electret microphone, switches & small surplus speaker.



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